

MADHAV INSTITUTE OF TECHNOLOGY & SCIENCE, GWALIOR
(A Govt. Aided UGC Autonomous & NAAC Accredited Institute Affiliated to RGPV, Bhopal)

Subject Name: Engineering Chemistry
Subject code 3000002 (Under Flexible Scheme-2019-20)
B.Tech. (First / Second semester) with effect from 01.07.2022

UNIT – I Chemistry of Water Analysis

Source and impurities, alkalinity, pH, hardness of water, interrelationship between alkalinity and hardness, degree of hardness, Standards of water for drinking purposes, Methods of water softening: lime- soda process, zeolite and ion exchange resin process. Scale formation: causes, effects and prevention. Caustic embitterment, priming, foaming, boiler corrosion and deaeration. Simple numerical problems on water softening based on lime soda process and water analysis.

UNIT –II Chemistry of Engineering Material

Lubricants-Introduction, functions of lubricants, types and classification of lubricants, solid lubricants, semi-solid lubricants, liquid lubricants, synthetic lubricants, lubricating emulsions, biodegradable lubricants, mechanism of lubrication, physical & chemical properties, testing of lubricants, types of greases, application of lubricants and silicones, selection of lubricants.

Cement: introduction & raw materials, gypsum cement, Types of cement, Methods of manufacturing cement: Wet process, Dry process, Semi-dry process. Chemistry of setting & Hardening of cement, Types of Portland cement and its derivatives.

Refractory.Introduction, classification of refractories and properties of refractories with reference to Refractoriness, RUL, Porosity, Thermal Spalling.

UNIT – III Chemicals of industrial importance

Fuels- Definition & Classification of fuels and their comparison. Calorific values, Determination of calorific value by Bomb calorimeter. Proximate and ultimate analysis of coal and their significance, Varieties of fuel oils, their properties and uses, knocking, anti-knocking compounds (octane & cetane number), simple numerical problems based on fuels.

UNIT – IV Polymers of Engineering importance

Introduction, types and classification of polymers, Types of polymerization: addition or chain polymerization, condensation polymerization and their mechanism,

Classification of plastic, important thermoplastic resins Nylon 66, Teflon, Polystyrene & important thermosetting resins Phenolic resin, Amino resin. Moulding of plastics. Natural & synthetic rubbers, Vulcanization, styrene rubber, polyurethanes, silicon rubber, reclaimed rubber, Introduction to polymer composites, Engineering Plastics, Polymer in medicine and surgery and conducting polymers.

UNIT – V Standard Methods of Chemical Analysis

Introduction to Chromatography- Classification of Chromatography Methods, Principle of Chromatographic Mechanisms, Terminology Used in Chromatography, Chromatographic Performance,

Isolation of Separated Components (Elution), Column, Thin layer and paper Chromatography .Principle, Instrumentation and application of Gas Chromatography.

Introduction to Spectroscopy-Ultra-Violet, and Visible Spectroscopy, Theory of ultraviolet visible spectroscopy, Types of electronic transitions, Chromophore, Auxochrome, Absorption and intensity shifts, The Absorption law. Instrumentation and Applications of ultraviolet-visible spectroscopy. Introduction of IR Spectroscopy.

Course outcomes: Upon successful completion of the course, the student will be able to

CO1 Integrate the importance of water treatment for domestic and Industrial purpose

CO2 Acquire the knowledge of the types, properties and application of advance Engineering material like lubricants, fuels.

CO3 Appreciate the knowledge of the types, properties and application of advanced polymer materials, cement, refractories.

CO4 Perform simple and complex calculations through problem solving methods.

CO5 Summarize the concept of chromatography and spectroscopy for various engineering applications related to day to day life.

Reference Books: -

- Engineering Chemistry- P.C.Jain and Monika Jain, Dhanpat Rai *Publishing Co (P) Ltd*, 2013
- Engineering Chemistry - B.K. Sharma, Krishna Publication, 2015
- A Text Book of Engineering Chemistry - S. S. Dara & A.K. Singh, S. Chand Publication, 2015.
- Applied Chemistry - Theory and Practice, O.P. Viramani, A.K. Narula, New Age Pub, 2008.
- Polymer Science – Ghosh, Tata McGraw Hill.2010
- Chemistry for Environmental Engineering - Sawyer, McCarty and Parkin – McGraw Hill, International.2003
- Industrial Chemistry - B.K. Sharma, GOEL Publishing house 2011

List of Experiments

Subject Name: Engineering Chemistry laboratory

Subject code 300002 (Under Flexible Scheme-2019-20)

B.Tech. (First / Second semester) with effect from 01.07.2022

NOTE: At least 10 of the following experiments must be performed during the session.

Experiment No.	Aim of experiment
1	Determination of Total hardness by Complexometric titration.
2	Determination of temporary and permanent hardness by Complexometric titration.
3	Determination of alkalinity of given water sample by neutralization Titration. (a) OH^- & CO_3^{2-} (b) CO_3^{2-} & HCO_3^-
4	Determination of percentage of Fe in Iron alloy solution by redox titration.
5	Determination of percentage of Cr in Chromium alloy solution by back titration.
6	Determination of Cu in Copper alloys solution by Iodometric Titration.
7	Determination of Viscosity of given oil sample by Redwood viscometer No.1
8	Determination of Flash & fire points of given oil sample by Pensky Martin close cup Apparatus.
9	Determination of Flash & fire point of given oil sample by Cleveland's open cup Apparatus.
10	Determination of Moisture content, volatile matter content, Ash content and fixed Carbon of a given sample of coal by proximate analysis.
11	Separation of the colour pigment of spinach leaf by paper chromatography.
12	Preparation of phenol formaldehyde resin by condensation polymerization.
13	Preparation of urea formaldehyde resin by condensation polymerization.