

19HS120 ENGINEERING CHEMISTRY (D)

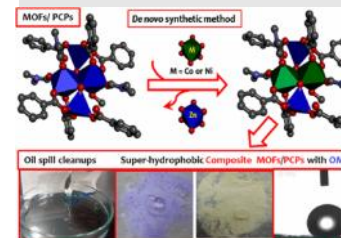
Hours Per Week :

L	T	P	C
3	-	2	4

Total Hours :

L	T	P
45	-	30

W/RA	SSH/HSH	CS	SA	S	BS
20	10	-	10	-	5



Source: Koya Prabhakara Rao et al., J. Am. Chem. Soc. 2018, 140, 42, 13786-13792

COURSE DESCRIPTION AND OBJECTIVES:

This course enables students understand some important topics in Chemistry which may be utilized later in their successive years. It is primarily focussed on applying the knowledge of Chemistry in agriculture & other related disciplines. Students are expected to learn and get familiar with the basic principles of phase rule for different systems, analysis of water sample & treatment methods, Science of corrosion, fundamentals of polymers, basics of Food Chemistry and advanced instrumental techniques.

Course Outcomes:

Upon completion of the course, the student will be able to achieve the following outcomes:

COs	Course Outcomes	POs
1	Apply the concept of phase rule in the separation process especially purification of precious metals.	1,2
2	Analyse the quality of water and design a suitable mechanism for its purification.	1,2,3
3	Apply various synthetic methods for preparing polymers for engineering applications.	1,2
4	Evaluate the concept of biomolecules from mankind to industrial processes with their potency to sustainable living organisms.	1,2,3
5	Apply the electromagnetic radiation to the spectroscopic methods for the analysis of engineering materials.	2,3,4,5

SKILLS:

- ✓ Determine calorific value of fuel.
- ✓ Analyze the total hardness of water sample.
- ✓ Synthesize various polymers.
- ✓ Characterize chemical compounds by using IR spectroscopic technique.

UNIT - I**L-9****PHASE RULE, FUELS AND COLLOIDS:**

Phase rule – Introduction to phase rule equation, Explanation of terms, Applications and derivation; Phase rule application to one component systems - water system; Two component systems – Lead silver system.

Fuels - Classification of fuels, Calorific value of fuel- HCV, LCV, bomb calorimeter.

Colloids - Classification and properties of colloids.

UNIT - II**L-9****WATER TECHNOLOGY AND CORROSION:**

Water technology- Temporary and permanent hardness; Disadvantages of hard water, Scale and sludge formation in boilers, Boiler corrosion; Softening of water by ion-exchange process, Desalination of brackish water by electrodialysis and reverse osmosis.

Corrosion - Causes, Types - dry corrosion, wet corrosion; Corrosion prevention by cathodic protection.

UNIT - III**L-9****POLYMERS AND LUBRICANTS:**

Polymers - Types of polymerization; Preparation, Properties and applications of polyethylene, PMMA, phenol formaldehyde, Nylon 6,6; Methods for the determination of molecular weight of polymers.

Lubricants - Classification, Properties - viscosity, viscosity index, flash and fire points, cloud and pour points, aniline number, Mechanical stability, Carbon residue and mechanism of lubrication.

UNIT- IV**L-9**

INTRODUCTION TO FOOD CHEMISTRY: Enzymes and their use in the manufacturing of ethanol and acetic acid by fermentation methods; Principles of food chemistry; Introduction to lipids, proteins, carbohydrates, vitamins with biological significance; Food preservatives, Colouring and flavouring reagents of food.

UNIT - V**L-9**

INSTRUMENTAL TECHNOLOGY: Analytical methods like thermogravimetric analysis (TGA); Differential thermal analysis (DTA); Polarographic analysis and analytical applications of radioactive materials; Introduction to IR spectroscopy.

LABORATORY EXPERIMENTS

LIST OF EXPERIMENTS

TOTAL HOURS: 30

1. Determination of temporary and permanent hardness of water by EDTA method.
2. Determination of chlorides in water.
3. Determination of dissolved oxygen in water.
4. Determination of BOD in waste water sample.
5. Determination of COD in waste water sample.
6. Determination of available Chlorine in bleaching powder.
7. Determination of alkalinity of water sample.
8. Determination of acidity of water sample.
9. Determination of Iron (II) in water by colorimetry.
10. Determination of carbonate and noncarbonated hardness by soda reagent.
11. Qualitative test for carbohydrates, fats and roteins.
12. Determination of fat constant – saponification values.
13. Estimation of vitamin C.
14. Determination iodine value – acid number.

ACTIVITIES:

- o *Analysis of water and its purification.*
- o *Soil analysis.*
- o *Food Analysis.*
- o *Preparation of soaps and detergents.*
- o *Electroplating and Electroless plating on different metal surfaces.*

TEXT BOOKS:

1. P.C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai Publications, 2010.
2. Shashi Chawala, "A Text Book of Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai Publications, 2015.
3. K.S. Maheswaramma and Mridula Chugh, "Engineering Chemistry", 1st edition, Pearson publication, 2015.

REFERENCE BOOKS:

1. Bahl B S, Arun Bahl and Tuli B D. "Essentials of Physical Chemistry". S. Chand and Co. Ltd., 2007.
2. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya Publications, 2007.
3. Shikha Agarwal, "Engineering Chemistry: Fundamentals and Applications", 2nd edition, Cambridge Publications, 2019.

LABORATORY MANUAL:

1. Sunita Rattan "Experiments in Applied Chemistry", S.K. Kataria & Sons Publications, 2008.