

22BEAS103 CHEMISTRY FOR AGRICULTURAL ENGINEERS

Hours Per Week :

L	T	P	C
2	0	2	3

PREREQUISITE KNOWLEDGE: Basic knowledge in chemistry at intermediate level.

COURSE DESCRIPTION AND OBJECTIVES:

This course is specifically designed for the students of B. Tech. Agricultural Engineering and covers some important topics from all the areas of chemistry. This course enables students with thorough understanding of concepts in chemistry, which may be utilized later in their successive years. Students get familiar with the basic principles of phase rule for different systems, analysis of water sample, science of corrosion, fundamentals of polymers, basics of food chemistry and advanced instrumental techniques. Students develop skills which are necessary to apply in specific agricultural engineering problems.

MODULE-1

UNIT-1

8L+0T+8P=16 Hours

WATER TECHNOLOGY & INTRODUCTION TO FOOD CHEMISTRY :

Water technology: Temporary and permanent hardness, action of soap with hard water and soft water, disadvantages of hard water, scale and sludge formation in boilers, boiler corrosion.

Introduction to food chemistry: Introduction to lipids, proteins, carbohydrates, vitamins with biological significance, food preservatives, colouring and flavouring reagents of food.

UNIT-2

8L+0T+8P=16 Hours

CORROSION, POLYMERS AND LUBRICANTS:

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

Polymers: Types of polymerization; Preparation, properties and applications of polyethylene, PMMA, phenol formaldehyde, nylon 6, 6.

Lubricants: Classification; Properties- viscosity, viscosity index, flash and fire points, cloud and pour points and mechanical stability.

PRACTICES:

- Determination of temporary-permanent hardness of water by EDTA method.
- Determination of chlorides in water.
- Determination of available chlorine in bleaching powder.
- Determination of alkalinity of water sample.
- Determination of carbonate and noncarbonate hardness by soda reagent.
- Determination of viscosity of oil.
- Synthesis of nylon-6,6 /Bakelite.

MODULE-2

UNIT-1

8L+0T+8P=16 Hours

PHASE RULE, FUELS AND COLLOIDS:

Phase rule: Introduction to phase rule equation, explanation of terms and derivation. Application of phase rule to one component systems- water system, two component systems – lead silver system.

Fuels: Classification of fuels; Calorific value of fuel- HCV, LCV; Bomb calorimeter.



Source: <https://www.dreamstime.com/photos-images/future-scientists.html>

SKILLS:

- ✓ Analyze the total hardness of water sample
- ✓ Analyze suitability of lubricant for particular application
- ✓ Synthesize various polymers
- ✓ Characterize chemical compounds by using IR spectroscopy

Colloids: Classification and properties of colloids – Tyndall effect, Brownian movement and electrophoresis.

UNIT-2**8L+0T+8P=16 Hours****INSTRUMENTAL TECHNIQUES:**

IR Spectroscopy: Introduction; Types of vibrations; Instrumentation of IR spectrophotometer and the applications.

Atomic absorption spectroscopy (AAS): Introduction; instrumentation and applications.

Nuclear radiation detectors: GM counter and analytical applications of radioactive materials.

PRACTICES:

- Determination of Iron (II) in water by colorimetry (verification of Beer-Lambert Law).
- CST of phenol-water system.
- Determination of dissolved oxygen in water.
- Determination of BOD in waste water sample.
- Determination of COD in waste water sample.
- Determination of acidity of water sample.
- Semi-micro inorganic salt analysis.
- Measurement of radioactivity of soil & water with help of GM counter.

COURSE OUTCOMES:

Upon successful completion of this course, students will have the ability to:

CO No.	Course Outcomes	Blooms Level	Module No.	Mapping with POs
1	Apply phase rule to one component and two component systems.	Apply	2	1, 2, 9, 10, 11, 12
2	Apply instrumental methods for analysis of different materials.	Apply	2	2, 3, 4, 5, 9, 10, 11, 12
3	Analyze the disadvantages of hard water and identify the chemical problems related to food chemistry.	Analyze	1	1, 2, 3, 9, 10, 11, 12
4	Recognize the disadvantages of corrosion and identify suitable prevention method. Assess various polymers and lubricants for engineering applications.	Analyze	1	1, 2, 3, 9, 10, 11, 12
5	Analyze the properties of colloidal systems and determine the calorific value of fuels.	Analyze	2	1, 2, 9, 10, 11, 12

TEXT BOOKS:

1. P. C Jain and Monica Jain, "Engineering Chemistry", 17th edition, Dhanpat Rai, 2010.
2. Shashi Chawala, "Engineering Chemistry Engineering Materials and Applications", 3rd edition, Dhanpat Rai, 2015.

REFERENCE BOOKS:

1. Bahl B S, Arun Bahl and Tuli B D., "Essentials of Physical Chemistry", 4th edition, S. Chand, 2017.
2. Gurudeep Raj and Chatwal Anand, "Instrumental Methods of Analysis", 5th edition, Himalaya, 2018.
3. H. J. Arnikar "Essentials of nuclear chemistry", 4th edition, New age, 2018.