

## ENGINEERING CHEMISTRY - I

Lectures : 3 periods / week  
Tutorials : 1 period / week  
Semester End Exam : 3 hrs

Sessional Marks : 40  
Semester End Exam Marks : 60  
Credits : 3

### Course Objectives :

- To know the quality parameters of water used in industries and for drinking purpose.
- To understand the methods of determining hardness, softening and desalination.
- To define the terms associated with phase rule and batteries..
- To acquire knowledge on advanced and latest material systems like liquid crystals, composites, etc.,

### Course Outcomes:

- Students acquire knowledge on quality and utility of water, useful in studying public health engineering.
- Knowledge acquired on phase rule gives good foundation for engineering students. (Specifically to Mechanical Engineering)
- Students know suitable replacements of metal after knowing about composite materials.
- Able to understand functioning of electrochemical energy systems.
- Would be capable of selecting appropriate lubricant for a given system.

### UNIT-I

#### Water Technology:

Various impurities of water, hardness units and determination by EDTA method (simple problems), water technology for industrial purpose: boiler troubles- scales, sludges, caustic embrittlement, boiler corrosion, priming and foaming- causes and prevention. Internal conditioning -phosphate, calgon and carbonate treatment. External conditioning-lime soda process (simple problems), softening by ion exchange process. Desalination of brackish water by electro dialysis and reverse osmosis.

### UNIT-II

#### Water treatment for drinking purpose-

WHO guidelines, sedimentation, coagulation, filtration (slow sand filter), various methods of chlorination, breakpoint chlorination.

#### Phase Rule:

Statement and explanation of the terms involved, one component water system, condensed phase rule- construction of phase diagram by thermal analysis, simple eutectic system (Pb-Ag system only), applications eutectic compounds.

### UNIT-III:

#### Electrochemistry:

Electrode potential, electrochemical series and its significance, Nernst equation-related problems, Reference electrodes (SHE and Calomel electrode) Ion-selective electrode-glass electrode and measurement of pH.

#### Electrochemical Energy Systems:

Types of electrochemical energy systems, electrochemistry of primary batteries (Lachlanche or dry cell), Secondary cells (Lead Acid cell, Ni-Cd cell), Lithium batteries (Li-MnO<sub>2</sub>, Lithium organic electrolyte) and their advantages. Fuel cells( Oxygen-Hydrogen)

#### **UNIT-IV:**

##### **Composites:**

Introduction, Constituents of Composites, Types –Fibre reinforced, Particulate and layered composites and their applications.

##### **Liquid crystals:**

Structure of liquid crystal forming compounds, Classification and applications.

##### **Lubricants:**

Classification, liquid lubricants- viscosity, Viscosity index, Flash point, Fire point, Cloud point, Pour point, oilyness. Solid lubricants –Graphite and Molybdenum sulphide, Additives

#### **TEXT BOOKS**

1. Engineering Chemistry, P.C. Jain and Monika Jain, 15<sup>th</sup> Edition, 2008, Dhanpat Rai Publishing Company, New Delhi.
2. A Text Book of Engineering Chemistry, Shashi Chawla, 3<sup>rd</sup> Edition, 2009, Dhanpat Rai and Co.(P) Ltd., New Delhi.

#### **REFERENCE BOOKS:**

1. A Text Book of Engineering Chemistry, S.S. Dara and S.S. Umare, 12<sup>th</sup> Edition, 2010, S.Chand and Co.Ltd.

#### **WEB REFERENCES:**

<http://www.wiziq.com/tutorial/>

<http://www.powerstream.com/BatteryFAQ.html#lec>

<http://www.cdeep.iitb.ac.in/nptel/Core%20Science/>

