COURSE CONTENT

ENGINEERING CHEMISTRY LAB

I Semester: CSE
II Semester: CE / CSD / CSM / ECE / EEE / ME

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
24X0072	Basic Science	0	0	2	1	40	60	100
Contact Classes: Nil	Tutorial Classes: Nil	Practical Classes: 30				Total Classes: 30		

Prerequisites: **Intermediate**

Course Overview:

The course encourages the use of analytical tools from an engineering standpoint. engineering chemistry by providing hands-on experience with the principles and techniques used in the study of chemical processes, material properties, and the application of chemistry in various engineering fields. It provides the overview of analytical techniques, and outline the importance of volumetric analysis and virtual lab experiments. The lab course is designed to help students develop practical skills in chemical analysis, synthesis, and experimentation. It enhances their problem-solving abilities, reinforces key scientific principles, and prepares them for more advanced studies in both chemistry and engineering applications

Course Objectives: The students will try to learn:

The course consists of experiments related to the principles of chemistry required for engineering student. The student will learn:

- Estimation of hardness of water to check its suitability for drinking purpose.
- Students are able to perform estimations of acids and bases using conductometry, potentiometry methods.
- Students will learn to prepare polymers such as Bakelite and Thiokol rubber in the laboratory.
- Students will learn skills related to the lubricant properties such as saponification value, surface tension and viscosity of oils.

Course Outcomes: After Completion of the Course, Students should be able to

CO1	**Recall** the steps involved in estimating the amount of iron (Fe) in a sample using volumetric analysis and **list** the reagents and equipment used to determine water hardness by the complexometric method. (BL1)
CO2	**Contrast** the fundamental concepts related to conductometry and potentiometry for acid-base concentration analysis. (BL2)
CO3	**Explain** the chemical reactions involved in forming Bakelite (phenol-formaldehyde) and Thiokol (sulfur-based polymerization) rubbers. (BL2)
CO4	**Demonstrate** the procedure to measure viscosity of lubricating oils using a viscometer (e.g., capillary, rotational), and **compare** the viscosity profiles of different grades of lubricating oils. (BL3)

CO5	**Describe** how virtual labs simulate real-world conditions through the working principles of: photovoltaic effect in solar cells, lithium-ion movement in EV batteries, redox reactions in fuel cells, and stimuli-responsive behavior of smart materials. (BL2)

List of Experiments:

I. Volumetric Analysis: Estimation of Hardness of water by EDTA Complexometric method.

II. Conductometry: Estimation of the concentration of an strong acid by Conductometry.

III. Potentiometry: Estimation of the amount of Fe^{+2} by Potentiometry.

IV. Dichrometry: Determination of Ferrous ion by Dichrometry

V. Preparations:

1. Preparation of Thiokol rubber

VI. Lubricants:

1. Estimation of acid value of given lubricant oil.
2. Estimation of Viscosity of lubricant oil using Ostwald's Viscometer.

VII. Preparation of Hand sanitizer (Isopropyl alcohol)

VIII. Virtual lab experiments

1. Construction of Fuel cell and its working.
2. Smart materials for Biomedical applications
3. Batteries for electrical vehicles.
4. Functioning of solar cell and its applications

List of Experiments: (Any 2 experiments are to be performed)

1. Preparation of Aspirin
2. Preparation of Paracetamol.

ELECTRONIC RESOURCES

1. https://www.youtube.com/watch?v=FCQ26RQBZLg&pp=ygUkZWR0YSBtZXRob2QgaW4gZW5naW5lZXJpbmcgY2hlbWlzdHJ5.
2. https://www.youtube.com/watch?v=2h01ovEzBTw&pp=ygU-Y29uZHVjdG9tZXRyaWMgdGl0cmF0aW9uIGVuZ2luZWVyaW5nIGNoZW1pc3RyeSBhbmltYXRpb24gdmlkZW8%3D.
3. https://www.youtube.com/watch?v=P1wRXTl2L3I&pp=ygU9UE9URU5USU9NRVRSSSB0aXRyYXRpb24gZW5naW5lZXJpbmcgY2hlbWlzdHJ5IGFuaW1hdGlvbiB2aWRlbw%3D%3D
4. https://www.youtube.com/watch?v=I0aYfmbGmSA&pp=ygU9VklTQ09TSVRZIEVYUEVXUklNRU5UUyAgZW5naW5lZXJpbmcgY2hlbWlzdHJ5IGFuaW1hdGlvbiB2aWRlbw%3D%3D
5. https://www.youtube.com/watch?v=2h01ovEzBTw&pp=ygUwQUNJRCBWQUxVRSBlbmdpbmVlcmluZyBjaGVtaXN0cnkgYW5pbWF0aW9uIHZpZGVv.

MATERIALS ONLINE:

1. EC Lab Manual
2. Open-ended experiments