



K L Deemed to be University

Department of Computer Science and Engineering-Honors -- KLVZA

Course Handout

2024-2025, Odd Sem

Course Title	: ENGINEERING CHEMISTRY
Course Code	:21CY1001
L-T-P-S Structure	: 3-0-2-0
Pre-requisite	:
Credits	: 4
Course Coordinator	:Deepti Kolli
Team of Instructors	:
Teaching Associates	:

Syllabus :Electrochemistry: Single electrode potential and its measurement, Electrochemical cells, EMF series, Nernst equation, Cell emf measurement, Reversible and irreversible cells, Concentration cells, Reference electrodes-Determination of pH using glass electrode. Gas Sensors: Capacitance Manometer and Mass Spectrometer. Batteries: Chemistry, construction and engineering aspects of Primary (mercury battery) and secondary (lead-Acid cell, Ni-Metal hydride cell, Lithium cells) and fuel cells– Hydrogen–Oxygen fuel cell, advantages of fuel cell;Energy and Chemistry: Energy Use and the World Economy, Defining Energy, Energy Transformation and Conservation of Energy, Heat Capacity and Calorimetry. Enthalpy, Hess's Law and Heats of Reaction, Energy and Stoichiometry.CORROSION & ITS CONTROL: Causes and different types of corrosion and effects of corrosion. Theories of corrosion– Chemical, Electrochemical corrosion, Pitting corrosion, stress corrosion, Galvanic corrosion.Factors affecting corrosion– Nature of metal, galvanic series, over voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment- effect of temperature, effect of pH, Humidity, effect of oxidant.Cathodic protection, sacrificial anode, impressed current cathode, electroplating: WATER Technology: Introduction, Hardness:Causes, expression of hardness – units – types of hardness, estimation of temporary and permanent hardness of water, numerical problems. Alkalinity and estimation of alkalinity of water, numerical problems.Boiler troubles – Scale & sludge formation, caustic embrittlement, Boiler corrosion, priming & foaming. Softening of water: Internal and external treatments -Lime soda, Ion exchange process.Desalination-reverse osmosis and electro dialysis:Chemical Kinetics: Ozone Depletion, Rates of Chemical Reactions, Rate Laws and the Concentration Dependence of Rates, Integrated Rate Laws, Temperature and Kinetics, Reaction Mechanisms, Catalysis, insight into Troposphere Ozone.Molecules and Materials: polymers- Types of polymerization-Mechanisms, Plastics – Thermoplastic resins and thermosetting resins - Preparation, properties and engineering applications of: polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde. Conducting Polymers: Polyacetylene, polyaniline, conduction, doping and applications.Carbon nano tubes and Applications.

Text Books :1. Engineering Chemistry,Jain&Jain,DhanpatRai Publishing Company.New Delhi. 2. Engineering Chemistry, O G Palanna, The Tata McGraw Hill, New Delhi.

Reference Books :1.

Chemistry in Engineering and Technology, Volume 2, J C Kuriacose & J Rajaram, Tata McGraw Hill, New Delhi. 2. Chemistry for Engineers Rajesh Agnihotri, Wiley, New Delhi. 3.

Engineering Chemistry, B. Sivasankar, The Tata McGraw Hill, New Delhi. 4.

A text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co. New Delhi. 5. Engineering Chemistry, C Parameswara Murthy, C V Agarwal and Andra Naidu, B S Publications, Hyderabad. 6. Engineering Chemistry, Shikha Agarwal, Cambridge University Press.

Web Links :1. <http://www.chem1.com/acad/webtext/elchem/> 2. <https://nptel.ac.in/downloads/122101001/> 3. <https://www2.chemistry.msu.edu/faculty/reusch/virttxtjml/polymers.htm>

Course Rationale :Engineering Chemistry is an applied manifestation of Chemistry and its thorough knowledge of fundamental aspects, is essential for all technical disciplines to understand chemical structure and other aspects of materials. The study of applied concepts of Chemistry endeavored in this course namely; chemical principles by examining materials with examples from energy generation and storage, water analysis and purification to emerging technologies.

Course Objectives :Provide in-depth knowledge on the principles of chemistry, to build a solid foundation in fundamentals of chemistry and an interface of theoretical concepts with their industrial/engineering applications.

COURSE OUTCOMES (COs):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Predict potential complications from combining various chemicals or metals in an engineering setting	PO1,PO3,PO7	2
CO2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena	PO1,PO3	2
CO3	Examine water quality and apply appropriate purification technique for intended problem	PO1,PO7	2
CO4	Explain the role of chemical kinetics in the formation and destruction of ozone in the atmosphere and predict the connection between molecular behavior and observable physical properties.	PO1,PO7	2
CO5	An ability to analyze and generate experimental skills	PO1,PO4	3

COURSE OUTCOME INDICATORS (COIs)::

Outcome No.	Highest BTL	COI-1	COI-2	COI-3
CO1	2	Btl-1 Recall the basic concepts of electrochemistry.	Btl-2 Explain the concept of electrode potential and redox equilibrium concerning the analysis and design of electrochemical cells.	
CO2	2	Btl-1 Relate the Mechanism of Corrosion of Metallic structures and metallurgy.	Btl-2 Outline various ways of formation of anodes and cathodes causing corrosion of metallic structures and predict appropriate corrosion control techniques in the given environment.	
CO3	2	Btl-1 Recall the water quality parameters and analysis of Hardness and alkalinity in context of BFW.	Btl-2 Discuss the boiler troubles and Solve problems based on Analytical volumetric estimations for Hardness and alkalinity.	

CO4	2	Btl-1 Describe the role of polymers.	Btl-2 Discuss the chemistry of polymers, Conducting polymers, and their engineering Applications.	
CO5	3		Btl-2 Describe the procedure of quantitative analysis.	Btl-3 Apply the principles of volumetric analysis to determine the quantity of the given sample.

PROGRAM OUTCOMES & PROGRAM SPECIFIC OUTCOMES (POs/PSOs)

Po No.	Program Outcome
PO1	Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences
PO3	Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations
PO4	Conduct Investigations of Complex Problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions for complex problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline.
PO5	Modern Tool Usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO6	The Engineer and Society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and Sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice
PO9	Individual and Team Work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions
PO11	Project Management and Finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long Learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.
PSO1	An ability to design and develop software projects as well as Analyze and test user requirements.

Lecture Course DELIVERY Plan:

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	Evaluation Components
1	CO1	COI-1	Basic concepts of electrochemistry-Electrode Potential, Single electrode potential	T1[CH.6]:279-294	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
2	CO1	COI-2	Measurement of Electrode Potential, Galvanic cell, Nernst equation	T1[CH.6]:279-294	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
3	CO1	COI-2	Electrochemical series, applications-Problems	T1[CH.6]:283-284	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
4	CO1	COI-2	Reference electrodes, Construction of Glass Electrode	T1[CH.6]:291-294	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
5	CO1	COI-2	Measurement of pH by glass electrode.	T1[CH.6]:295-297	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
6	CO1	COI-2	Introduction to batteries. construction and engineering aspects of Hg battery	T1[CH.6]:291-303	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
7	CO1	COI-2	Pb-Acid Storage Battery	T1[CH.6]:309-310.	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
8	CO1	COI-2	Li-ion battery	T2:96,99-100.R4:E42-44	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
9	CO1	COI-2	Ni-metal hydride & H ₂ -O ₂ Fuel cell	T1[CH.6]:306-308	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	Evaluation Components
10	CO1	COI-2	Methanol- oxygen Fuel cell	T1[CH.6]:306-308	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
11	CO2	COI-1	Introduction to corrosion, Causes-Effects of Corrosion, Theories of corrosion–Chemical corrosion	T1[CH.7]:329-332	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
12	CO2	COI-2	Theories of corrosion–Chemical corrosion/ dry corrosion	T1[CH.7]:329-332	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
13	CO2	COI-2	Electrochemical corrosion and corrosion reactions	T1[CH.7]:332-340	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
14	CO2	COI-2	Types of wet corrosion– Pitting Corrosion Galvanic Corrosion, Stress Corrosion	T1[CH.7]:332-340.	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
15	CO2	COI-2	Factors affecting corrosion– Nature of metal, Nature of Environment	T1[CH.7]:341-344	Chalk,PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
16	CO2	COI-2	Control Methods–Cathodic protection	T1[CH.7]:347-348.R4:C.S 15-17	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
17	CO2	COI-2	Electroplating	R4:C.S 15-17;T1[CH.7]:347-352	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
18	CO2	COI-2	Corrosion Control & Protection Methods	R4:C.S 15-17;T1[CH.7]:347-352	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM1
19	CO2	COI-	Revision of CO1 and CO2	T1[CH.6]:306-	Chalk,PPT,Talk	ALM,End Semester

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	Evaluation Components
		2		308; T1[CH.7]:332-340		Exam,Home Assignment,SEM-EXAM1
20	CO3	COI-1	Introduction, Hardness: Causes, Expression of hardness – units – types of hardness	T1[CH.1]: 1-5, R4:A.C228- 233	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
21	CO3	COI-2	Estimation of temporary and permanent hardness of water	T1[CH.1]: 1-5, R4:A.C228- 233	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
22	CO3	COI-2	Estimation of temporary and permanent hardness of water, numerical problems	T1[CH.1]: 1-5, R4:A.C228- 233	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
23	CO2	COI-2	Alkalinity and estimation of alkalinity of water, numerical problems	T1[CH.1]: 28-32,R4:A.C 246-252	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
24	CO3	COI-2	Boiler troubles - Scale & sludge formation, Caustic embrittlement	T1[CH.1]: 6-12,R4:A.C 253-259	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
25	CO3	COI-2	Boiler corrosion, Priming & foaming.	T1[CH.1]: 6-12R4:A.C 257-261	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
26	CO3	COI-2	Softening of water: Internal and external treatments - Lime soda Process-Cold- Lime soda – hot Lime soda Process.	T1[CH.1]: 25-27;R4:A.C 294	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
27	CO3	COI-2	Ion exchange process	T1[CH.1]:: 12-15,R4:A.C 261-274,285	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
28	CO3	COI-2	Desalination methods- Reverse osmosis – Electrodialysis	T1[CH.1]: 25-27;R4:A.C 294-295;R3:25- 27	PPT,Talk	ALM,End Semester Exam,Home

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	Evaluation Components
						Assignment, SEM-EXAM2
29	CO3	COI-2	CO 3	T1[CH.1]: 25-27;R4:A.C 294-295;R3:25- 27	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
30	CO4	COI-2	Introduction-Definition – Types of polymerization, Mechanism: Free Radical Polymerization	T1[CH.3]:119-130	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
31	CO4	COI-2	Mechanism: Zeigler Natta Polymerization	T1[CH.3]:119-130	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
32	CO4	COI-2	Plastics – Thermoplastic resins and Thermosetting resins - Differences between Thermoplastics & Thermosetting Plastics.	T1[CH.3]:142-152.R4:A.C 1-5	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
33	CO4	COI-2	Preparation, properties and engineering applications of: polyethylene, PVC, Teflon	T1[CH.3]:142-152.R4:A.C 1-5	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
34	CO4	COI-2	Bakelite, Urea Formaldehyde	T1[CH.3]:142-152.R4: A.C 1-5	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
35	CO4	COI-2	Conducting Polymers: Poly acetylene, doping, applications	T1[CH.3]:178-180,R4:A.C 66-84	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
36	CO4	COI-2	Conducting Polymers: polyaniline, conduction, doping, applications	T1[CH.3]:178-180,R4:A.C 66-84	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
37	CO4	COI-2	Nano Chemistry: Carbon nano tubes and Applications	T1:119-130; R4:A.C 1-5	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2

Sess.No.	CO	COI	Topic	Book No[CH No][Page No]	Teaching-Learning Methods	Evaluation Components
38	CO4	COI-2	Nano Chemistry: CNT, Applications	T1:119-130; R4:A.C 1-5	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2
39	CO4	COI-2	conducting polymers and nano chemistry	T1:119-130; R4:A.C 1-5	PPT,Talk	ALM,End Semester Exam,Home Assignment,SEM-EXAM2

Lecture Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 understand the origin of the difference in electrode potential across an interface, in particular, a metal/electrolyte interface

Session Outcome: 2 differentiate between standard and single electrode potential

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
10	Course handout discussion	1	PPT	--- NOT APPLICABLE ---
5	Introduction to Electro Chemistry	1	PPT	--- NOT APPLICABLE ---
10	Origin of Electrode potential, Standard Electrode potential	1	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Single electrode potential	1	PPT	--- NOT APPLICABLE ---
10	Points to ponder	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 understand the measurement of single electrode potential and EMF of the cell across an interface

Session Outcome: 2 Explain the Nernst equation

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Measurement of Electrode Potential	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Galvanic cell, Nernst equation	2	PPT	--- NOT APPLICABLE ---
10	Points to ponder	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 1 understand electrochemical series in design of electrochemical cells

Session Outcome: 2 solve problems using electro chemical series

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Electrochemical series, applications-Problems	2	PPT	--- NOT APPLICABLE ---
5	ALM	2	Talk	One minute paper
20	Numerical Problems	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 1 Explain about the types of reference electrodes

Session Outcome: 2 Explain the construction and uses of glass electrode

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE

20	Reference electrodes	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Construction of Glass Electrode	2	PPT	--- NOT APPLICABLE ---
10	Ask a student to summarize the lecture's key ideas	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 1 Use the knowledge of reference electrodes to the analysis

Session Outcome: 2 Demonstrate the measurement of pH

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Measurement of pH by glass electrode.	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Measurement of pH by glass electrode-Derivation	2	PPT	--- NOT APPLICABLE ---
10	Ask a student to summarize the lecture's key ideas	2	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 6

Session Outcome: 1 Understand the operating principles of batteries

Session Outcome: 2 Illustrate the Chemistry of Mercury button cell

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---

20	Flipped Learning - Video: Introduction to batteries construction	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	Engineering aspects of Hg battery	3	PPT	--- NOT APPLICABLE ---
10	Ask for and answer student questions	2	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 1 understand the operating principles and Chemistry of storage (secondary) cells.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Flipped learning: Video- Charging And Discharging mechanism of Pb-Acid Storage Battery	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	Charging And Discharging mechanism of Pb-Acid Storage Battery: Discussion	3	PPT	--- NOT APPLICABLE ---
10	Applications of Pb-Acid Storage Battery: Discussion	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 8

Session Outcome: 1 explain the knowledge in smart technology

Session Outcome: 2 illustrate the chemistry of Li-ion battery

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Flipped learning video: Charging and Discharging mechanism of Li-ion Storage Battery	3	PPT	--- NOT APPLICABLE ---

5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	Working of Li ion battery: discussion	3	PPT	--- NOT APPLICABLE ---
10	Applications of Li ion battery: discussion	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 1 explain the principle of used in automobiles in order to reduce environmental pollution and in smart technology.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Flipped learning: Mechanism and working of Ni-metal hydride	2	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	flipped learning video: H ₂ -O ₂ Fuel cell working mechanism	3	PPT	--- NOT APPLICABLE ---
10	applications of H ₂ -O ₂ Fuel cell	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 1 explain the principle of used in automobiles in order to reduce environmental pollution and in smart technology

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Mechanism and working of methanol- oxygen fuel cell	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---

10	Applications of methanol- oxygen fuel cell	3	PPT	--- NOT APPLICABLE ---
10	ALM	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 11

Session Outcome: 1 Explain the causes and effects of corrosion

Session Outcome: 2 Describe the mechanisms of Dry (Chemical) corrosion

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Introduction, Causes and Effects of Corrosion	1	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Examples of corrosion with respect to engineering applications	2	PPT	--- NOT APPLICABLE ---
10	Ask a student to summarize the lecture's key ideas	1	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 12

Session Outcome: 1 describe the mechanisms of Dry (Chemical) corrosion

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Dry corrosion mechanism	2	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	pilling bed worth rule	2	PPT	--- NOT APPLICABLE ---

10	Ask a student to summarize the lecture's key ideas	2	Talk	--- NOT APPLICABLE ---
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SESSION NUMBER : 13

Session Outcome: 1 Causes and the mechanisms of wet (Electro chemical) corrosion.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
25	Electrochemical corrosion and corrosion reactions	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
5	ALM	2	PPT	Think / Pair / Share
10	ALM	2	Talk	Think / Pair / Share

SESSION NUMBER : 14

Session Outcome: 1 discuss the causes of and the mechanisms of several types of wet corrosion

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Types of wet corrosion-Pitting Corrosion	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
20	Galvanic Corrosion-Stress Corrosion	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 15

Session Outcome: 1 interpret Primary & Secondary factors influencing rate of corrosion

Time(min)	Topic	BTL	Teaching-Learning	Active Learning

			Methods	Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Flipped learning video: Factors affecting corrosion– Nature of metal	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
20	Factors affecting corrosion: reasoning & examples	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 16

Session Outcome: 1 identify materials that will exhibit adequate corrosion resistance in a particular environment

Session Outcome: 2 select suitable protection method to prevent corrosion.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	2	Talk	--- NOT APPLICABLE ---
20	Control Methods –Cathodic protection	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	ALM	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 17

Session Outcome: 1 propose economically viable remedial actions that will eliminate or reduce corrosion to a tolerable level.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Protection methods: Electroplating	3	PPT	--- NOT APPLICABLE ---

5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	Protection methods: Electroless plating	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 18

Session Outcome: 1 propose economically viable remedial actions that will eliminate or reduce corrosion to a tolerable level.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Flipped learning: Corrosion Control techniques	2	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	ALM	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 19

Session Outcome: 1 apply the concepts of electrochemistry and corrosion to engineering applications

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	CO 1 revision	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	CO 2 revision	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 20

Session Outcome: 1 explain Quality of Water, Hardness and its types

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Hardness: Causes, Expression of hardness	1	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
20	Units – types of hardness	1	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 21

Session Outcome: 1 understand the principle of EDTA method

Session Outcome: 2 determine the hardness of given water sample

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Principle and chemistry of EDTA method	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
20	Estimation of temporary and permanent hardness of water	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 22

Session Outcome: 1 estimate the amount of hardness in the given water samples.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	flipped learning: Estimation of temporary and permanent hardness of water	3	PPT	--- NOT APPLICABLE ---

5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	Numerical Problems	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 23

Session Outcome: 1 explain the chemistry involved in estimation of alkalinity

Session Outcome: 2 estimate the amount of alkalinity of a given water sample

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	flipped learning: Alkalinity and estimation of alkalinity of water	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	Numerical Problems	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 24

Session Outcome: 1 predict which chemical entities causes Boiler Troubles, their disadvantages.

Session Outcome: 2 explain the removal techniques used for boiler troubles.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Boiler troubles - Scale & sludge formation	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Boiler troubles - Scale & sludge formation	2	PPT	--- NOT APPLICABLE ---

10	Ask for and answer student questions	2	Talk	--- NOT APPLICABLE ---
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SESSION NUMBER : 25

Session Outcome: 1 predict which chemical causes Boiler Troubles, their disadvantages and removal techniques

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Boiler corrosion	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Priming & foaming	2	PPT	--- NOT APPLICABLE ---
10	ALM	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 26

Session Outcome: 1 identify and explain various water softening (External treatment) methods

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Flipped learning: Softening of water: Internal and external treatments - Lime soda Process-Cold Lime soda	2	PPT	--- NOT APPLICABLE ---
5	Internal and external treatments: Discussion	2	Talk	--- NOT APPLICABLE ---
5	ask for and answer students questions	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 27

Session Outcome: 1 describe the chemistry and working of Ion exchange method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Water Softening Process: Ion exchange process	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	Advantages and disadvantages of ion exchange process	2	PPT	--- NOT APPLICABLE ---
10	Ask for and answer student questions	2	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 28

Session Outcome: 1 identify that desalination process as future solution for fresh water needs

Session Outcome: 2 illustrate the chemistry and working of electrodialysis

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
25	Desalination methods-Reverse osmosis and electrodialysis-working and applications	3	PPT	--- NOT APPLICABLE ---
20	ALM	3	Talk	Quiz/Test Questions

SESSION NUMBER : 29

Session Outcome: 1 apply the suitable purification method and determine the various quality parameters

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
45	Revise CO 3	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 30

Session Outcome: 1 identify and formulate polymers and have knowledge of various polymers which have engineering application

Session Outcome: 2 explain the free radical mechanism

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap & Raise a question to be answered by the end of the session	1	Talk	--- NOT APPLICABLE ---
20	Introduction-Definition – Types of polymerization, Mechanism	1	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
20	Free Radical Polymerization Mechanism	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 31

Session Outcome: 1 identify and formulate polymers and have knowledge of various polymers mechanisms

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Mechanism: Zeigler Natta Polymerization	2	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
5	ALM	3	PPT	Video synthesis

SESSION NUMBER : 32

Session Outcome: 1 identify the role of plastics in engineering applications

Session Outcome: 2 differentiate between thermoplastics and thermosetting plastics

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE

20	Thermoplastic resins and Thermosetting resins	2	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	Differences between Thermoplastics & Thermosetting Plastics	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 33

Session Outcome: 1 explain, preparation and application of thermoplastics

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Preparation, properties and engineering applications of: polyethylene, PVC	3	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
20	Preparation, properties and engineering applications of: Teflon	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 34

Session Outcome: 1 explain, preparation and application of thermos settings

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	preparation and applications of Bakelite	2	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	preparation and applications of urea-formaldehyde	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 35

Session Outcome: 1 explain significance of conducting polymers

Session Outcome: 2 describe the mechanism of doping and their applications

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Conducting Polymers: Poly acetylene, doping	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	applications of conducting polymers	3	PPT	--- NOT APPLICABLE ---
10	Ask a student to summarize the lecture's key ideas	3	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 36

Session Outcome: 1 explain conducting mechanism in polyaniline

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Conducting Polymers: polyaniline	3	PPT	--- NOT APPLICABLE ---
5	Discussion	1	Talk	--- NOT APPLICABLE ---
10	doping, applications	3	PPT	--- NOT APPLICABLE ---
10	Ask for and answer student questions	2	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 37

Session Outcome: 1 acquire the knowledge of nano chemistry and current applications

Session Outcome: 2 Describe approaches to sustainable development using nanochemistry

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Nano Chemistry: Carbon nano tubes	3	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
10	CNT Applications	3	PPT	--- NOT APPLICABLE ---
10	ALM	3	Talk	One-Minute Paper

SESSION NUMBER : 38

Session Outcome: 1 Explain the methods of synthesis of nanomaterials

Session Outcome: 2 describe the applications of nanomaterials in the field of engineering

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
20	Preparation of CNTs	2	PPT	--- NOT APPLICABLE ---
5	Discussion	2	Talk	--- NOT APPLICABLE ---
20	Applications of nano chemistry	3	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 39

Session Outcome: 1 recollect the concepts of polymers

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE

25	Revise the important concepts of polymers	3	PPT	--- NOT APPLICABLE ---
20	ALM	3	Talk	--- NOT APPLICABLE ---

Tutorial Course DELIVERY Plan: NO Delivery Plan Exists

Tutorial Session wise Teaching – Learning Plan

No Session Plans Exists

Practical Course DELIVERY Plan:

Tutorial Session no	Topics	CO-Mapping
1	Introduction to Engineering Chemistry Laboratory	CO5
2	Determination of the concentration of unknown solutions (NaOH/HCl)	CO5
3	Determination of total alkalinity of a water sample	CO5
4	Estimation of hardness of water by EDTA titration method (Complexometry)	CO5
5	Determination of chloride content in water sample	CO5
6	Determination of the rate constant of a reaction.	CO5
7	Determination of Dissolved Oxygen in the given water sample.	CO5
8	Estimation of amount of iron using potentiometric method.	CO5
9	Conductometric titration of strong acid with strong base.	CO5
10	Estimation of amount of an acid using pH- metric method.	CO5
11	Synthesis of a polymer/drug.	CO5
12	Estimation of KMnO ₄ using standard Oxalic acid solution	CO5
13	Estimation of amount of ferrous and ferric ion using standard K ₂ Cr ₂ O ₇ solution	CO5
14	Estimation of Vitamin – C	CO5

Tutorial Session no	Topics	CO-Mapping
15	Estimation of Copper using Colorimeter.	CO5

Practical Session wise Teaching – Learning Plan

SESSION NUMBER : 1

Session Outcome: 1 At the end of the class student will be able to know about the experiments going to be performed in Engineering Chemistry laboratory

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
30	Introduction to qualitative and quantitative analysis	2	PPT	--- NOT APPLICABLE ---
30	Explanation of the concentration terms	2	PPT	--- NOT APPLICABLE ---
40	Types of titrations	2	PPT	--- NOT APPLICABLE ---

SESSION NUMBER : 2

Session Outcome: 1 At the end of the class student will be able to determine the concentration of unknown solutions

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Recap	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 3

Session Outcome: 1 At the end of the class student will be able to determine total alkalinity of a water sample

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	2	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 4

Session Outcome: 1 At the end of the class student will be able to estimate hardness of water by EDTA titration method (Complexometry)

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 5

Session Outcome: 1 At the end of the class student will be able to determine chloride content of any given water sample

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 6

Session Outcome: 1 At the end of the class student will be able to determine the rate constant of a reaction

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 7

Session Outcome: 1 At the end of the class student will be able to determine Amount of Dissolved Oxygen in the given water sample

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods

5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 8

Session Outcome: 1 At the end of the class student will be able to estimate the amount of iron using potentiometric method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 9

Session Outcome: 1 At the end of the class student will be able to determine the quantity of acid sample by measuring the change in conductance.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---

10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 10

Session Outcome: 1 At the end of the class student will be able to estimate the amount of an acid using pH-metric method

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	LTC	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 11

Session Outcome: 1 At the end of the class student will be able to synthesis a simple polymer

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---

55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 12

Session Outcome: 1 At the end of the class student will be able to use principle of redox reaction to determine the amount of KMnO4.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 13

Session Outcome: 1 At the end of the class student will be able to determine amount of ferrous and ferric ion using redox titration

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---

20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 14

Session Outcome: 1 At the end of the class student will be able to determine amount of vitamin- C present in the given sample using iodometry.

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---
10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---

SESSION NUMBER : 15

Session Outcome: 1 At the end of the class student will be able to determine amount of copper by using the beer-lambert's law

Time(min)	Topic	BTL	Teaching-Learning Methods	Active Learning Methods
5	Submission of record	1	Talk	--- NOT APPLICABLE ---
10	Experiment explanation	2	PPT	--- NOT APPLICABLE ---
55	Experimentation	3	LTC	--- NOT APPLICABLE ---
20	Assessment and Interaction	4	Talk	--- NOT APPLICABLE ---

10	Documenting Results Summary and result Explanation	4	Talk	--- NOT APPLICABLE ---
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Skilling Course DELIVERY Plan: NO Delivery Plan Exists

Skilling Session wise Teaching – Learning Plan

No Session Plans Exists

WEEKLY HOMEWORK ASSIGNMENTS/ PROBLEM SETS/OPEN ENDED PROBLEM-SOLVING EXERCISES etc:

Week	Assignment Type	Assignment No	Topic	Details	co
3	Weekly Homework Assignments	1	Batteries	Give an account of the construction, chemical reactions involved, merits, demerits, and applications of the following: a. Dry cell b. Lithium-ion battery c. Nickel – Cadmium battery d. Nickel –metal hydride cells e. Zinc aircells.	CO1
6	Weekly Homework Assignments	2	Corrosion	Discuss the mechanism involved in the chemical and electrochemical theory of corrosion.	CO2
9	Weekly Homework Assignments	3	Water Technology	1. A sample of water is found to contain the following dissolving salts in milligrams per litre Mg(HCO ₃) ₂ = 73, CaCl ₂ = 111, Ca(HCO ₃) ₂ = 81, MgSO ₄ = 40, NaCl = 10, and MgCl ₂ = 95. Calculate temporary and permanent hardness and total hardness. 2. Write a brief account of a) caustic embrittlement and b) boiler corrosion	CO3
12	Weekly Homework Assignments	4	Polymers	1. Discuss the differences between thermoplastics and Thermosets? 2. Discuss the Coordination mechanism for the polymerization of polypropene.	CO4

COURSE TIME TABLE:

	Hour	1	2	3	4	5	6	7	8	9
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Day	Component								
Mon	Theory	V-S11,V-S12,V-S13,V-S14,V-S15,V-S16,V-S17	V-S11,V-S12,V-S13,V-S14,V-S15,V-S16,V-S17	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--
	Lab	V-S18	V-S18	V-S35	V-S35	V-S36	V-S36	--	--
	Skilling	--	--	--	--	--	--	--	--
Tue	Theory	V-S11,V-S12,V-S13,V-S14,V-S15,V-S16,V-S18	--	V-S17,V-S18	V-S18	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--
	Lab	V-S17	V-S17	V-S11	V-S11	V-S12	V-S12	--	V-S13
	Skilling	--	--	--	--	--	--	--	--
Wed	Theory	V-S31,V-S32,V-S33,V-S34,V-S35,V-S36,V-S37	V-S31,V-S32,V-S33,V-S34,V-S35,V-S36,V-S37	V-S37,V-S38	V-S38	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--
	Lab	V-S38	V-S38	V-S31	V-S31	V-S32	V-S32	--	V-S33
	Skilling	--	--	--	--	--	--	--	--
Thu	Theory	V-S21,V-S22,V-S23,V-S24,V-S25,V-S26,V-S27	V-S21,V-S22,V-S23,V-S24,V-S25,V-S26,V-S27	V-S27,V-S28	V-S28	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--
	Lab	V-S28	V-S28	V-S21	V-S21	V-S22	V-S22	--	V-S23
	Skilling	--	--	--	--	--	--	--	--
Fri	Theory	V-S31,V-S32,V-S33,V-S34,V-S35,V-S36,V-S38	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--
	Lab	V-S37	V-S37	V-S25	V-S25	V-S26	V-S26	--	--
	Skilling	--	--	--	--	--	--	--	--
Sat	Theory	V-S21,V-S22,V-S23,V-S24,V-S25,V-S26,V-	--	--	--	--	--	--	--

	S28								
Tutorial	--	--	--	--	--	--	--	--	--
Lab	V-S27	V-S27	V-S15	V-S15	V-S16	V-S16	--	---	---
Skilling	--	--	--	--	--	--	--	---	---
Sun	Theory	--	--	--	--	--	--	--	--
	Tutorial	--	--	--	--	--	--	--	--
	Lab	--	--	--	--	--	--	--	--
	Skilling	--	--	--	--	--	--	--	--

REMEDIAL CLASSES:

Supplement course handout, which may perhaps include special lectures and discussions that would be planned, and schedule notified according

SELF-LEARNING:

Assignments to promote self-learning, survey of contents from multiple sources.

S.no	Topics	CO	ALM	References/MOOCS
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DELIVERY DETAILS OF CONTENT BEYOND SYLLABUS:

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

S.no	Advanced Topics, Additional Reading, Research papers and any	CO	ALM	References/MOOCS
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EVALUATION PLAN:

Evaluation Type	Evaluation Component	Weightage/Marks		Assessment Dates	Duration (Hours)	CO1	CO2	CO3	CO4	CO5
End Semester Summative Evaluation Total= 40 %	Lab End Semester Exam	Weightage	16		100					16
		Max Marks	50							50
	End Semester Exam	Weightage	24		180	6	6	6	6	
		Max Marks	100			25	25	25	25	
In Semester Formative Evaluation Total= 22 %	Continuous Evaluation - Lab Exercise	Weightage	7		100					7
		Max Marks	240							240
	Home Assignment and Textbook	Weightage	7		30	1.75	1.75	1.75	1.75	
		Max Marks	40			10	10	10	10	
	ALM	Weightage	8		30	2	2	2	2	

		Max Marks	100			25	25	25	25	
In Semester Summative Evaluation Total= 38 %	Lab In Semester Exam	Weightage	8	100						8
		Max Marks	50							50
	Semester in Exam-II	Weightage	15	90				7.5	7.5	
		Max Marks	50							
	Semester in Exam-I	Weightage	15	90			7.5	7.5		
		Max Marks	50							

ATTENDANCE POLICY:

Every student is expected to be responsible for regularity of his/her attendance in class rooms and laboratories, to appear in scheduled tests and examinations and fulfill all other tasks assigned to him/her in every course. In every course, student has to maintain a minimum of 85% attendance to be eligible for appearing in Semester end examination of the course, for cases of medical issues and other unavoidable circumstances the students will be condoned if their attendance is between 75% to 85% in every course, subjected to submission of medical certificates, medical case file and other needful documental proof to the concerned departments.

DETENTION POLICY :

In any course, a student has to maintain a minimum of 85% attendance and In-Semester Examinations to be eligible for appearing to the Semester End Examination, failing to fulfill these conditions will deem such student to have been detained in that course.

PLAGIARISM POLICY :

Supplement course handout, which may perhaps include special lectures and discussions

COURSE TEAM MEMBERS, CHAMBER CONSULTATION HOURS AND CHAMBER VENUE DETAILS:

Supplement course handout, which may perhaps include special lectures and discussions

Name of Faculty	Delivery Component of Faculty	Sections of Faculty	Chamber Consultation Day (s)	Chamber Consultation Timings for each day	Chamber Consultation Room No:	Signature of Course faculty:
Raja Sekhara Prasad Kottapalli	L	37-MA,16-MA	-	-	-	-
Raja Sekhara Prasad Kottapalli	P	37-MA,16-MA	-	-	-	-
Jagarlapudi Kumar	L	14-MA,26-MA	-	-	-	-
Jagarlapudi Kumar	P	26-MA,14-MA	-	-	-	-
Venkateswara Rao Anna	L	28-MA,18-MA	-	-	-	-

Venkateswara Rao Anna	P	18-MA,28-MA	-	-	-	-
Alka Kamble	L	23-MA,11-MA,38-MA	-	-	-	-
Alka Kamble	P	11-MA,23-MA,38-MA	-	-	-	-
Naresh Mameda	L	34-MA,27-MA	-	-	-	-
Naresh Mameda	P	34-MA,27-MA	-	-	-	-
Niranjan Patra	L	33-MA	-	-	-	-
Niranjan Patra	P	33-MA	-	-	-	-
Koyilapu Rambabu	L	12-MA,21-MA,31-MA	-	-	-	-
Koyilapu Rambabu	P	31-MA,12-MA,21-MA	-	-	-	-
Tummala Anusha	L	32-MA,13-MA,24-MA	-	-	-	-
Tummala Anusha	P	13-MA,24-MA,32-MA	-	-	-	-
Tinku Baidya	L	36-MA,15-MA,25-MA	-	-	-	-
Tinku Baidya	P	36-MA,25-MA,15-MA	-	-	-	-
Sivasankara Rao Ede	L	35-MA,17-MA,22-MA	-	-	-	-
Sivasankara Rao Ede	P	35-MA,22-	-	-	-	-

GENERAL INSTRUCTIONS

Students should come prepared for classes and carry the text book(s) or material(s) as prescribed by the Course Faculty to the class.

NOTICES

Most of the notices are available on the LMS platform.

All notices will be communicated through the institution email.

All notices concerning the course will be displayed on the respective Notice Boards.

Signature of COURSE COORDINATOR

(Deepti Kolli)

Signature of Department Prof. Incharge Academics & Vetting Team Member

Department Of CSE-Honors

HEAD OF DEPARTMENT:

Approval from: DEAN-ACADEMICS

(Sign with Office Seal) [object HTMLDivElement]