

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF CHEMISTRY
I B.TECH – I SEMESTER (common to CE , ME & CHEMICAL)
(THEORY)

Subject Code	Title of the Subject	L	T	P	C
19A53101	Engineering Chemistry	3	0	-	3

COURSE OBJECTIVES	
1	To familiarize engineering chemistry and its applications
2	To impart the concept of soft and hard waters, softening methods of hard water
3	To train the students on the principles and applications of electrochemistry, polymers, surface chemistry, and cement

COURSE OUTCOMES	
CO1	list the differences between temporary and permanent hardness of water, explain the principles of reverse osmosis and electrodialysis. compare quality of drinking water with BIS and WHO standards. illustrate problems associated with hard water - scale and sludge. explain the working principles of different Industrial water treatment processes
CO2	apply Nernst equation for calculating electrode and cell potentials, apply Pilling Bedworth rule for corrosion and corrosion prevention, demonstrate the corrosion prevention methods and factors affecting corrosion, compare different batteries and their applications
CO3	explain different types of polymers and their applications, Solve the numerical problems based on Calorific value , select suitable fuels for IC engines, explain calorific values, octane number, refining of petroleum and cracking of oils
CO4	explain the constituents of Composites and its classification Identify the factors affecting the refractory material, Illustrate the functions and properties of lubricants, demonstrate the phases and reactivity of concrete formation, identify the constituents of Portland cement, enumerate the reactions at setting and hardening of the cement
CO5	summarize the applications of SEM, TEM and X-ray diffraction in surface characterization, explain the synthesis of colloids with examples, outline the preparation of nanomaterials and metal oxides identify the application of colloids and nanomaterials in medicine, sensors and catalysis

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

SYLLABUS

Unit 1: Water Technology (8 hrs)

Introduction –Causes and types of hardness of water, Estimation of hardness of water by EDTA Method - Boiler troubles , Industrial water treatment (Ion exchange process, Internal treatment of water) specifications for drinking water, Bureau of Indian Standards(BIS) and World health organization(WHO) standards, zeolite and ion-exchange processes. - desalination of brackish water, reverse osmosis (RO) and electrodialysis.

Unit 2: Electrochemistry and Applications(10 hrs)

Electrodes – concepts, electrochemical cell, Nernst equation, cell potential calculations.

Primary cells – Zn-MnO₂ (Leclanche cell), Li Battery. Secondary cells – lead acid and lithium ion batteries- working of the batteries including cell reactions.

Fuel cells- Basic Principles and Working Principles of hydrogen-oxygen, methanol -oxygen fuel cells, Applications of Fuel cells.

Corrosion: Introduction to corrosion, electrochemical theory of corrosion, differential aeration cell corrosion, galvanic corrosion, metal oxide formation by dry corrosion, Pilling Bedworth rule and uses, Factors affecting corrosion, Corrosion Control -cathodic and anodic protection, electroplating and electro less plating (Nickel and Copper).

Unit 3: Polymers and Fuel Chemistry:(12 hrs)

Introduction to polymers, functionality of monomers, Mechanism of chain growth, step growth and coordination polymerization,

Thermoplastics and Thermo-setting plastics-: Preparation, properties and applications of PVC and Bakelite, Biodegradable polymers

Fuels – Types of fuels, calorific value, numerical problems based on calorific value; Analysis of coal, Liquid Fuels refining of petroleum, fuels for IC engines, knocking and anti-knock agents, Octane and Cetane numbers, cracking of oils; alternative fuels- propane, methanol and ethanol, bio fuels.

UNIT-4 Basic Engineering Materials(8Hrs)

(i)Composites- Definition, Constituents, Classification- Particle, Fibre and Structural reinforced composites, properties and Engineering applications

(ii)Refractories- Classification, Properties, Factors affecting the refractory materials and Applications

(iii)Lubricants- Classification, Functions of lubricants, Mechanism, Properties of lubricating oils and Applications

(iv)Building materials- Portland Cement, constituents, phases and reactivity of clinker, Setting and Hardening of cement.

Unit 5: Surface Chemistry and Applications (10 hrs)

Introduction to surface chemistry, colloids, micelle formation, synthesis of colloids (any two methods with examples), chemical and electrochemical methods (not more than two methods) of preparation of nanometals and metal oxides, stabilization of colloids and nanomaterials by stabilizing agents, solid-gas interface, solid-liquid interface, adsorption isotherm, applications of colloids and nanomaterials – catalysis, medicine, sensors.

Text Books:

1. Engineering Chemistry by KNJayaveera, GVSubba Reddy and C. Ramachandraiah, McGraw Hill Higher Education, Foruth Edition, New Delhi
2. A Text Book of Engineering Chemistry, Jain and Jain, Dhanapathi Rai Publications, New Delhi

References:

1. A Text book of Engineering Chemistry by K. Sesa Maheswaramma and Mridula Chugh, Pearson's Publications Pvt. Ltd., (PAN India Title)
2. A Text book of Engineering Chemistry by SS Dhara, S. Chand Publications, New Delhi
3. Engineering Chemistry by K.B.Chandra Sekhar, UN.Das and Sujatha Mishra, SCITECH Publications India Pvt Limited.
4. A Text book of Engineering Chemistry by Prasanta Rath, B. Rama Devi, Ch.Venkata Ramana Reddy and Subhendu Chakroborty, Cengage learning India Pvt.Ltd.
5. Chemistry of Engineering Materials, C.V.Agarwal, C.Parameswaramurthy and Andranaidu
6. Text Book of Engineering Chemistry, Shashichawla, Dhanapathirai Publications.

①
② Jeyaraj
③ N. S. S. S.
④ K. S.
⑤ B. R. S.
⑥ S. S. S.
⑦ S. S. S.
⑧ S. S. S.
⑨ S. S. S.

JNTUA COLLEGE OF ENGINEERING (AUTONOMOUS):: PULIVENDULA
DEPARTMENT OF CHEMISTRY
I B.TECH – I SEMESTER (common to CE, ME & CHEMICAL)
(ENGINEERING CHEMISTRY LAB)

Subject Code	Title of the Lab	L	T	P	C
19A53103	Engineering Chemistry lab	-	-	4	2

COURSE OBJECTIVES	
1	Verify the fundamental concepts with experiments

COURSE OUTCOMES	
CO1	determine the cell constant and conductance of solutions (L3)
CO2	prepare advanced polymer materials (L2)
CO3	determine the physical properties like surface tension, adsorption and viscosity (L3)
CO4	estimate the Iron and Calcium in cement (L3)
CO5	calculate the hardness of water (L4)

Mapping between Course Outcomes and Programme Outcomes

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1												
CO2												
CO3												
CO4												
CO5												

LIST OF EXPERIMENTS

1. Determination of Hardness of a groundwater sample.
2. pH metric titration of (i) strong acid vs. strong base, (ii) weak acid vs. strong base
3. Determination of cell constant and conductance of solutions
4. Potentiometry - determination of redox potentials and emfs
5. Determination of Strength of an acid in Pb-Acid battery
6. Preparation of a polymer
7. Determination of percentage of Iron in Cement sample by colorimetry
8. Estimation of Calcium in port land Cement
9. Adsorption of acetic acid by charcoal
10. Determination of percentage Moisture content in a coal sample
11. Determination of Viscosity of lubricating oil by Red Wood Viscometer 1
12. Determination of Flash and Fire points of fuels
13. Determination of Calorific value of gases by Junker's gas Calorimeter

TEXT BOOKS:

1. Vogel's Text book of Quantitative Chemical Analysis, Sixth Edition – J. Mendham et al, Pearson Education.
2. Chemistry Practical – Lab Manual by Chandra Sekhar, GV Subba Reddy and Jayaveera

①
 ② *Srinivasulu*
 ③ *Vijay*
 ④ *hnd*
 ⑤ *R.R. Raut*
 ⑥ *A. Srinivasulu*
 ⑦ *Cee*
 ⑧ *Vijay*

