



Muffakham Jah College of Engineering and Technology
(Sultan-ul-uloom Education Society)

Affiliated to Osmania University, Approved by AICTE

Accredited by NAAC and NBA (Civil, CSE, ECE and Mech)

Mount Pleasant, 8-2-249 to 267, Road No. 3, Banjara Hills, Hyderabad - 500 034, Telangana, India

Lighted to Enlighten

ESTD : 1980



A UGC Autonomous institution from the year 2025-26

Scheme of Instruction, Examination & Syllabi of
ENGINEERING CHEMISTRY
(COMMON TO ALL BRANCHES)
for B.E. I and II Semester of Four-Year Degree program

(With effect from the AY – 2025-2026)

Bachelor of Engineering (B.E) R 25

Courses offered:

BE (CSE, CSE (AI), CSE(DS), CSE(AI&ML), ECE, ME & CE)


Dr. A. Krishnam Raju
Prof. of Chemistry
University College of Technology
Osmania University
Hyderabad-500007
College of Technology

















Hyderabad-500007

SCHEME OF INSTRUCTION & EXAMINATION

I-SEMESTER/ II -SEMESTER

S. No	Course Code	Course Title	Scheme of Instruction				Scheme of Examination			Credits
			L	T	D/P	Contact Hrs/Wk	CIE	SEE	Duration in Hrs	
Theory Courses										
1	*MJ25MC102CE	Environmental Sciences	2	-	-	2	-	-	-	0
2	*MJ25MC103	Essence of Indian Traditional Knowledge	2	-	-	2	-	-	-	0
3	MJ25HS101EG	English	2	-	-	2	40	60	3	2
4	MJ25BS101MT	Matrices & Differential Calculus	3	1	-	4	40	60	3	4
5	MJ25BS104CH	Engineering Chemistry	3	1	-	4	40	60	3	4
6	MJ25ES101CS	Programming for Problem Solving	3	-	-	3	40	60	3	3
Practical/Laboratory Courses										
7	MJ25HS151EG	English Lab	-	-	2	2	25	50	3	1
8	MJ25BS152CH	Engineering Chemistry Lab	-	-	2	2	25	50	3	1
9	MJ25ES154ME	Engineering Workshop Practice	-	-	2x2	4	25	50	3	2
10	MJ25ES151CS	Programming for Problem Solving Lab	-	-	2	2	25	50	3	1
Total			15	2	10	27	260	440	24	18

MC: Mandatory Course BS: Basic Science ES: Engineering Science

HS: Humanities & Social Sciences L: Lecture T: Tutorial P: Practical

D: Drawing CIE: Continuous Internal Evaluation SEE: Semester End Evaluation

*GRADE: Satisfactory/Unsatisfactory (Non-credit Mandatory Course)

Muffakham Jah College of Engineering & Technology

Common to all Branches

University College
Osmania University
Hyderabad-500007

Course Code	Course Title				Core/Elective	
MJ25BS104CH	ENGINEERING CHEMISTRY Common to (CSE ,CSE(AI) ,CSE(DS), CSE(AIML), ECE,CE,ME)				Core	
Pre-requisites	Contact hours per week			CIE	SEE	Credits
	L	T	P			
Chemistry	3	1	0	40	60	4

Course Objectives: To learn

1. Explain the principles of electrochemical processes and study analyze working principles and applications of Various batteries.
2. Gain knowledge about the causes of corrosion and its prevention. Attain Knowledge about the hard water and treatment of water for drinking purpose.
3. Appraise Engineering materials their classifications, structure-property Relationship
4. Expose to qualitative and quantitative parameters of chemical fuels and awareness of eco-friendly materials, fuels and processes.
5. Understand the concepts and applications of spectroscopy.

Course Outcomes: After learning the contents of this course, the student must be able to

1. Apply concept of electrode potential in identifying feasibility of electrochemical reaction; develop a more in-depth perception on working of various types of batteries and their applications especially in electric vehicles.
2. Identify the mechanism of corrosion of materials on the basis of electrochemical approach and devise corrosion control methods; Estimate the physical and chemical parameters of quality of water and explain the process of water treatment.
3. Explain the influence of chemical structure on properties of materials and their choice in engineering applications.
4. Classify chemical fuels and grade them through qualitative analysis and Acquire knowledge on environment friendly bio-diesel.
5. Relate the concept of green chemistry to modify engineering processes and materials; understand the concepts and applications of spectroscopy

UNIT-1: Electrochemistry: Electrolytic conductance, its types, factors affecting electrolytic conductance. Electrochemical cells: Electrolytic and Galvanic cells. Cell notation, cell reaction and cell potentials. Electrochemical series & its significance. Nernst equation and its derivation. Applications of Nernst equation to electrode potential and EMF of cells. Numerical problems. Types of electrodes, Calomel, Quinhydrone and Glass electrodes. Determination of pH of a solution by using Quinhydrone electrode.

Battery Chemistry: Types of batteries-Primary and secondary batteries, Construction and Applications of Secondary batteries: Pb-Acid storage battery and Li-ion battery, Fuel cells: Methanol-Oxygen fuel cells and Hydrogen-oxygen fuel cells.

UNIT-2: Corrosion: Causes and its effects. Types of Corrosion-Dry or Chemical Corrosion and Wet or Electrochemical corrosion and their mechanism. Electrochemical corrosion — Galvanic and Waterline Corrosion. Factors influencing rate of corrosion.

Corrosion control methods: Cathodic protection methods - Sacrificial anodic and Impressed current Cathodic protection methods.

Surface coating methods: Hot Dipping-Galvanizing.

Water Chemistry : Hardness of Water-Types and units of hardness of water, estimation of hardness of water by EDTA method - Numerical problems. Alkalinity of water and its sources. Water softening by Ion exchange and Reverse Osmosis methods. Specifications of potable water. Sterilization by Chlorination. Break Point of Chlorination.

UNIT-3: Engineering Materials: Polymers: Monomer and its functionality, Polymers and degree of polymerization. Types of Polymerization - Addition, Condensation and Co-Polymerization with one example each. Classification of polymers—Plastics: (Thermoplastics & Thermosetting Resins - PVC and Bakelite), Fiber's: (Nylon-6:6)

Elastomers: (Buna-S and Buna—N rubber).

Conducting polymers: Introduction, classification, properties and applications of conducting polymers.

Biomaterials : Introduction, Definition of Biomaterials, Preparation, properties and applications of Poly lactic acid (PLA).

UNIT — 4: Chemical Fuels : Introduction, definition and classification of chemical fuels. - primary and secondary — solid, liquid and gaseous fuels Requirements of a good fuel. Calorific Value — HCV and LCV. Theoretical Calculations of calorific value by Dulong's formula — Numerical problems.

Solid Fuels: Coal and its Ranking. Analysis of coal-Proximate and Ultimate analysis.

Liquid Fuels: Composition and uses of Gasoline, Diesel and kerosene. Knocking, Fuel-rating— Octane and Cetane numbers.

Gaseous Fuels : LPG, CNG-Composition and Uses.

Biodiesel : Sources , Concept of Trans esterification , properties and applications of biodiesel . Carbon neutrality and its significance .

Unit-5: Spectroscopy- Description of Electromagnetic spectrum.

Principles of UV-Visible Spectroscopy: Statement of Beer-Lambert law Absorbance and intensity shifts: Bathochromic, Hypsochromic, Hyperchromic and Hypochromic shifts , Types of Electronic transitions .

Applications of UV — Visible Spectroscopy.

IR Spectroscopy : Principle and applications of IR spectroscopy

NMR Spectroscopy: Principle of H-1 NMR Spectroscopy, Multiplicity, Chemical Shift, Applications of NMR. Principle & Applications of MRI.

Green Chemistry : Concept, Mention – Principles of Green Chemistry – example Diels-Alder reaction.

Suggested Books:

1. Principles of Physical Chemistry I, S.N. Chand & Co. New Delhi, 1987
2. PC Jain and M Jain ,—Engineering Chemistry I, Dhanpat Rai&Sons, 15th Edition, New Delhi, 2004
3. JCKuriacoseandJRajaram,—ChemistryinEngineeringandTechnology—,TataMcGrawHill, a. New Delhi,2010
4. OG Palanna, —Engineering Chemistry I,TataMcGrawHill, New Delhi, 2009
5. S S Daraand SSU mare, —Engineering Chemistry I, S.N. Chand & Co. New Delhi, 2004
6. Sashi Chawla,—Engineering Chemistry I, DhanpatRai&Sons, New Delhi, 2017
7. Prasanta Rath,—Engineering Chemistry I,Cengage Learning India Pvt. Ltd, 2015
8. Dr. Kishore Palle, Dr. V. Shanthi , Dr. A. Kishore Kumar and K. Ramesh -Engineering Chemistry.
9. Dr.Shanthi Vunguturi ,Dr.Geetha Swarupa Pamidimalla – Fundamentals of Engineering Chemistry ,Applications in Modern Engineering and Technology

Course Code	Course Title				Core/ Elective
MJ25BS152C H	Engineering Chemistry Lab Common to (CSE ,CSE(AI) ,CSE(DS), CSE(AIML), ECE,CE,ME)				Core
Pre requisite	Contact Hours per Week			CI	Credits
	L	T	P	E	
-	-	-	2	25	50
					1

Course Objectives: To learn

1. Conduct experiments, take measurements and analyze the data through hands-on experience in order to demonstrate understanding of the theoretical concepts of quantitative analysis while working in small group.
2. Interpret the electro analytical principles with experimental results graphically
3. Demonstrate writing skills through clear laboratory reports

Course Outcomes: After learning the contents of this course, the student must be able to

1. Apply the Electro analytical techniques in quantitative analysis.
2. Estimate the amount of Iron (II), hardness and alkalinity present in the given test solution.
3. Synthesize small drug molecules

List of Experiments:

- Introduction to Chemical Analysis.

Volumetric Analysis:

- Preparation of Standard Mohr's salt solution, Standardization of KMnO_4 and estimation of ferrous ion by Permanganometry
- Estimation Iron(II) by Dichrometry.

Water Analysis:

- Preparation of Standard Magnesium sulphate solution, standardization of EDTA and Estimation of Total Hardness.
- Preparation of Standard Sodium Carbonate Solution, Standardization of HCl and Estimation of Carbonate and Bicarbonate Alkalinity.

Conductometry:

- Estimation of HCl
- Estimation of CH_3COOH
- Estimation of mixture of acids

Potentiometry

- Estimation of HCl
- Estimation of Iron

pH metry:

- Estimation of HCl

Colorimetry:

- Verification of Beer-Lambert's law and estimation of Manganese

Drug Synthesis

- Preparation of Aspirin

Polymer Synthesis

- Preparation of Urea-Formaldehyde resin.

Note: Minimum ten experiments should be conducted in the semester.

Suggested Books:

- Senior Practical Physical Chemistry ,B.D.Khosla , A .Gulati and V.Garg (R.Chand&Co.,Delhi).
- An Introduction to Practical Chemistry , K.K.Sharma and D.S.Sharma (Vikas publishing , N.Delhi)

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