

ACADEMIC LESSON PLAN FOR APPLIED CHEMISTRY & ENVIRONMENTAL SCIENCE (2026-2027)

COURSE CODE – TH 3

	Year:1st	Name of the Teaching Faculty: Sasmita Moharana,Sr. Lecturer Chemistry
Subject: Applied Chemistry & Environmental Science	No of Days /per week class allotted: 4	From date: 17/08/2026 to 17/04/2027 No of Weeks: 32
Week	Class Day	Theory Topics
	1st	UNIT-1: Air and Noise Pollution Rutherford model of atom (10 Periods) Definition of pollution and pollutant, classification of pollutant(primary and secondary)
	2nd	Natural and man-made sources of air pollution.
	3rd	Air Pollutants: Types, Particulate Pollutants and Their Effects
	4th	Bag Filter & Cyclone Separator
2nd	1st	Electrostatic Precipitator (ESP)
	2nd	Gaseous Pollution Control: Catalytic Converter
	3rd	Effects of Pollution due to Refrigerants, I.C. Engines & Boilers
	4th	Introduction to Noise Pollution & Sources
3rd	1st	Effects and Control of Noise Pollution
	2nd	Revision, Discussion, and Assessment
	3rd	UNIT-2: Water and Soil Pollution (12 Periods) Sources of Water Pollution, Types of Water Pollutants
	4th	Water Quality Characteristics – Turbidity, pH, TSS, TS
4th	1st	Water Quality Characteristics – BOD & COD
	2nd	Primary Wastewater Treatment – Sedimentation & Froth Flotation
	3rd	Secondary Wastewater Treatment – Activated Sludge Process
	4th	Secondary Wastewater Treatment – Bioreactor
5th	1st	Wastewater Treatment – Tertiary Methods (Membrane Separation Technology, Reverse Osmosis)
	2nd	Soil Pollution – Definition, Causes
	3rd	Effects of Soil Pollution
	4th	Preventive Measures of Soil Pollution
6th	1st	Effects of Fertilizers, Pesticides, Insecticides, Irrigation & E-Waste on Soil Pollution
	2nd	Revision, Discussion, and Assessment
	3rd	UNIT-3: Solid Waste Management (10 Periods) Introduction to Solid Waste Management and Sources of Waste
	4th	Municipal Solid Waste (MSW): Characteristics and Sources
7th	1st	E-Waste and Biomedical Waste

	2nd	Industrial Waste: Metallic and Non-Metallic Wastes
	3rd	Collection and Disposal of Municipal Solid Waste
	4th	3R Principles, Energy Recovery, and Sanitary Landfill
8th	1st	Hazardous Waste Management
	2nd	Concept of Carbon Credit, Carbon Footprint.
	3rd	Environmental Management in Fabrication Industry
	4th	Revision, Discussion, and Assessment
9th	1st	UNIT-4: Electrochemistry & Corrosion (16 Periods) Electronic Concept of Oxidation & Reduction
	2nd	Redox Reactions
	3rd	Definition of terms: electrolytes, non-electrolytes with suitable examples,
	4th	Electrolysis Basics & Faraday's First Law of electrolysis
10th	1st	Faraday's Second Law of electrolysis
	2nd	Industrial Application of Electrolysis –Electrometallurgy
	3rd	Industrial Applications of Electrolysis-Electroplating & Electrolytic refining.
	4th	Application of redox reactions in electrochemical cells – Primary cells – dry cell
11th	1st	Secondary cell - commercially used lead storage battery
	2nd	fuel cells
	3rd	Introduction to Corrosion of metals - definition, types of corrosion (chemical and electrochemical),
	4th	H ₂ liberation and O ₂ absorption mechanism of electrochemical corrosion
12th	1st	Factors Affecting Corrosion
	2nd	Internal corrosion preventive measures –Purification, alloying and heat treatment
	3rd	External corrosion preventive measures: a) metal (anodic, cathodic) coatings, b) organic inhibitors.
	4th	Revision, Discussion, and Assessment
13th	1st	UNIT-5: Chemistry of Fuels and Lubricants (14 Periods) Definition of fuel, classification of fuels
	2nd	Calorific Value, Higher Calorific Value (HCV), Lower Calorific Value (LCV),
	3rd	Liquid fuel petrol- composition, properties, applications, octane number and its significance
	4th	Liquid Fuel Diesel- Composition, properties, applications, cetane number and its significance,

14th	1st	Chemical composition, calorific values and applications of LPG & CNG
	2nd	Chemical composition, calorific values and applications of water gas & producer gas
	3rd	Chemical composition, calorific values and applications of coal gas and biogas.
	4th	Lubricant – Definition, function, classification with examples
15th	1st	Lubrication definition and mechanism (hydrodynamic and boundary lubrication)
	2nd	Physical Properties of Lubricants- Viscosity, viscosity index, oiliness, significance and applications
	3rd	Physical Properties of Lubricants- flash point, fire point, cloud point, pour point, importance in selection of lubricants
	4th	Chemical Properties of Lubricants : Coke number, total acid number (TAN), saponification value, significance
16th	1st	Characteristic properties of good lubricant.
	2nd	Revision, Discussion, and Assessment
	3rd	UNIT-6: Atomic Structure, Chemical Bonding and Solutions (21 Periods) Rutherford Model of Atom
	4th	Failures of Rutherford Model
17th	1st	Bohr's Theory of Atom
	2nd	Hydrogen Spectrum
	3rd	Quantum Numbers-Principal, azimuthal, magnetic and spin quantum numbers
	4th	Orbital Concept-Orbitals, shapes of s, p and d orbitals
18th	1st	Pauli's exclusion principle, Heisenberg uncertainty principle
	2nd	Aufbau principle
	3rd	Electronic configurations (up to atomic number 30). Hund's rule of maximum multiplicity.
	4th	Concept of chemical bonding – cause of chemical bonding, types of chemical bonds
19th	1st	Ionic Bonding-Formation of ionic bond, NaCl as an example
	2nd	Covalent Bonding-Covalent bond formation, examples: H ₂ , F ₂ and HF
	3rd	Basic concept of orbital overlapping sigma and pi bonds

	4th	Concept of hybridization, sp hybridization in BeCl_2
20th	1st	sp^2 hybridization in BF_3 and sp^3 hybridization in CH_4
	2nd	sp^3 hybridization in NH_3 and H_2O , molecular shapes
	3rd	Coordinate bond in NH_4^+ ion, metallic bonding and its properties
	4th	Hydrogen bond and anomalous properties of NH_3 , H_2O due to hydrogen bonding,
21st	1st	Solution – idea of solute, solvent and solution, methods to express the concentration of solution normality & molarity
	2nd	Methods to express the concentration of solution molality, ppm, mass percentage, volume percentage and mole fraction.
	3rd	Revision, Discussion, and Assessment
	4th	UNIT-7: Water and Water Treatment (13 Periods) Graphical presentation of water distribution on Earth (pie or bar diagram). Classification as soft and hard water
22nd	1st	Causes of hardness, types of hardness (temporary and permanent),
	2nd	unit of hardness and simple numerical on water hardness and conversion.
	3rd	Cause of poor lathering of soap in hard water
	4th	problems caused by the use of hard water in boiler (scale and sludge)
23rd	1st	problems caused by the use of hard water in boiler (foaming and priming, corrosion etc.),
	2nd	Quantitative measurement of water hardness by EDTA method,
	3rd	total dissolved solids (TDS) alkalinity estimation.
	4th	Water softening techniques – soda lime process
24th	1st	Water softening techniques –zeolite process
	2nd	Water softening techniques –ion exchange process.
	3rd	Municipal water treatment (in brief only) – sedimentation, coagulation, filtration, sterilization.
	4th	Revision, Discussion, and Assessment
25th	1st	UNIT-8: Engineering Materials (11 Periods) Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue (matrix) flux, slag,

	2nd	General Principles of Metallurgy
	3rd	Alloys – definition, purposes of alloying, ferrous alloys and nonferrous with suitable examples
	4th	properties and applications of Brass, Bronze, Stainless Steel, Alnico, Duralumin.
26th	1st	Polymers – monomer, homo and co polymers, degree of polymerization,
	2nd	Addition polymerization and condensation polymerization with suitable examples
	3rd	Preparation reactions, properties and applications of PVC, Polystyrene (PS) and PTFE (Teflon)
	4th	Preparation reaction, properties and applications of Bakelite
27th	1st	Preparation reactions, properties and applications of Nylon-6 and Nylon-6,6
	2nd	Natural rubber, vulcanization of rubber, advantages of vulcanized rubber over natural rubber
	3rd	Revision, Discussion, and Assessment
	4th	UNIT-9: Ecosystem (8 Periods) Structure of ecosystem, Biotic & Abiotic components
28th	1st	Food Chain and Food Web
	2nd	Aquatic Ecosystem- Lentic and lotic ecosystems
	3rd	Terrestrial Ecosystem- Grassland, forest and desert ecosystems
	4th	Biogeochemical Cycles- Carbon cycle and Nitrogen cycle
29th	1st	Biogeochemical Cycles- Sulphur cycle and Phosphorus cycle
	2nd	Global warming -Causes, effects, process, Green House Effect
	3rd	Ozone Depletion & Revision
	4th	UNIT-10: Renewable sources of Energy (13 Periods) Solar Energy: Basics of Solar energy
30th	1st	Liquid and air flat plate collectors,
	2nd	Theory of flat plate collector, importance of selective coating, efficiency factors
	3rd	Advanced collector- Solar pond & Solar water heater

	4th	Advanced collector-solar dryer & Solar stills
31st	1st	Biomass: Overview of biomass as energy source, thermal characteristics of biomass as fuel
	2nd	Anaerobic digestion. Biogas production mechanism and Utilization.
	3rd	Wind energy: Future prospects of wind energy. Wind energy in India
	4th	Environmental benefits and problem of wind energy.
32nd	1st	New Energy Sources: Need of new sources. Different types new energy sources.
	2nd	Hydrogen energy and tidal energy conversion – concept and applications
	3rd	Concept, origin and power plants of geothermal energy.
	4th	Revision, Discussion, and Assessment

CO-I Analyze real life problems associated with various environmental pollution, effects and controlling measures and to mitigate with solid wastes.

CO- II Solve the engineering problems using concepts of electrochemistry, corrosion, fuel and lubricant for domestic and industrial applications.

CO-III Solve various engineering problems applying the basic concepts of atomic structure, chemical bonding and solutions.

CO-IV Use relevant water treatment method to solve domestic and industrial problems.

CO-V Solve the engineering problems using concepts of engineering materials and properties.

CO-VI Understand ecosystem and harnessing renewable energy from various sources.

Sasmata Moharana

Signature of the faculty