

GOVT. POLYTECHNIC DEBAGADA
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DEPARTMENT OF HUMANITIES & SCIENCES
LESSON PLAN (1ST YEAR AY-2026-27)

SUBJECT- APPLIED CHEMISTRY AND ENVIRONMENTAL SCIENCE

Discipline :Civil,Electrical, Mechanical, Mining Engg.		NEW 1ST YEAR DIPLOMA ENGG.	Name of the Teaching Faculty :- Kuni Majhi, Sr. Lect. In Chemistry
Course Code : TH3		From date :17.08.2026 --- Date : 17.04.2027	No. of weeks:31
week	No. of days/week class allotted:04	Topics	
		UNIT-1: Air and Noise Pollution (10 Periods)	
3rd	1st	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: Effects and control (Bag filter)	
	4th	Air Pollutants: Types, Particulate Pollutants: Effects and control (Cyclone separator)	
4th	1st	Air Pollutants: Types, Particulate Pollutants: Effects and control (Electrostatic Precipitator)	
	2nd	Gaseous Pollution Control: Catalytic Converter, Effects of air pollution due to Refrigerants	
	3rd	Effects of air pollution due to Refrigerants	
	4th	Effects of air pollution due to I.C., Boiler	
5th	1st	Noise pollution: Definition, sources of pollution,Effects and control of Noise Pollution.	
	2nd	REVISION	
		UNIT-2: Water and Soil Pollution (12 Periods)	
6th	1st	Sources of water pollution, Types of water pollutants	
	2nd	Characteristics of water pollutants Turbidity, pH, total suspended solids,	
	3rd	Total solids BOD and COD.	
	4th	Waste Water Treatment: Primary methods: sedimentation, froth floatation.	
7th	1st	Waste Water Treatment: Secondary methods, Activated sludge treatment.	
	2nd	Waste Water Treatment: , Bioreactor,Tertiary Method: Membrane separation technology	
	3rd	Tertiary Method: RO (reverse osmosis).	
	4th	Soil Pollution: Definition, Causes, Effects and Preventive measures of Soil Pollution	
8th	1st	Effects of Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation.	
	2nd	E-Waste on soil pollution	
	3rd	Characteristics of water pollutants Turbidity, pH, total suspended solids,	
	4th	REVISION	
		UNIT-3: Solid Waste Management (10 Periods)	
9th	1st	Solid waste generation- Sources and characteristics of: Municipal solid waste.	

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	2nd	Solid waste generation- E- waste biomedical waste.
	3rd	Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.
	4th	Collection and disposal: MSW (3R, principles)
	1st	Collection and disposal:(energy recovery, sanitary landfill)
10th	2nd	Hazardous waste.
	3rd	Concept of Carbon Credit, Carbon Footprint
	4th	Environmental management in fabrication industry
		IST INTERNAL ASSESSMENT
		UNIT-4: Electrochemistry & Corrosion (16 Periods)
11th	1st	Electronic concept of oxidation, reduction and redox reactions.
	2nd	Definition of terms: electrolytes, non-electrolytes with suitable examples
	3rd	Faradays laws of electrolysis and simple numerical problems.
	4th	Industrial Application of Electrolysis –Electrometallurgy, Electroplating,Electrolytic refining.
12th	1st	Application of redox reactions in electrochemical cells
	2nd	Primary cells – dry cell,Secondary cell - commercially used lead storage battery and fuel
	3rd	Introduction to Corrosion of metals - definition, types of corrosion (chemical and
	4th	H ₂ liberation and O ₂ absorption mechanism of electrochemical corrosion,factors affecting rate of corrosion.
13th	1st	Internal corrosion preventive measures –Purification
	2nd	alloying and heat treatment and External corrosion preventive measures: a) metal (anodic, cathodic) coatings.
	3rd	alloying and heat treatment and External corrosion preventive measures: b) organic inhibitors.
		UNIT-5: Chemistry of Fuels and Lubricants (14 Periods)
	4th	Definition of fuel, classification of fuels, calorific values (HCV and LCV)
14th	1st	Liquid fuels petrol and diesel - fuel rating (octane and cetane numbers)
	2nd	Chemical composition, calorific values and applications of LPG, CNG, water gas.
	3rd	Definition of fuel, classification of fuels, calorific values (HCV and LCV)
	4th	Liquid fuels petrol and diesel - fuel rating (octane and cetane numbers)
15th	1st	Chemical composition, calorific values and applications of LPG, CNG, water gas.
	2nd	Chemical composition, calorific values and applications of coal gas, producer gas and biogas.
	3rd	Lubricant – Definition, function, classification with examples
	4th	Lubrication definition and mechanism (hydrodynamic)
16th	1st	Lubrication definition and mechanism (Boundary lubrication)
	2nd	Physical properties (viscosity and viscosity index, oiliness, flash and fire point, cloud and pour point only)
	3rd	chemical properties (coke number, total acid number saponification value) of lubricants,
	4th	MONTHLY TEST-II
		UNIT-6: Atomic Structure, Chemical Bonding and Solutions (21 Periods)
17th	1st	Rutherford model of atom and its failures,
	2nd	Bohr's theory (expression of energy and radius to be omitted)
	3rd	hydrogen spectrum explanation based on Bohr's model of atom
	4th	Quantum numbers – orbital concept. Shapes of s, p and d orbitals

18th	1st	Pauli's exclusion principle, Heisenberg uncertainty principle, Aufbau principle
	2nd	Electronic configurations (up to atomic number 30)
	3rd	Hund's rule of maximum multiplicity
	4th	Concept of chemical bonding – cause of chemical bonding
19th	1st	Types of bonds: ionic bonding (NaCl example)
	2nd	Covalent bond (H ₂ , F ₂ , HF)
	3rd	Basic concept of orbital overlapping sigma and pi bonds
	4th	Concept of hybridization, hybridization in BeCl ₂ , BF ₃)
0	1st	Concept of hybridization, hybridization in CH ₄ , NH ₃ , H ₂ O)
	2nd	Hydrogen bond and anomalous properties of NH ₃ , H ₂ O due to hydrogen bonding
	3rd	Solution – idea of solute, solvent and solution
9	4th	Methods to express the concentration of solution normality
20th	1st	Methods to express the concentration of solution molarity, molality,
	2nd	Methods to express the concentration of solution molality,
	3rd	ppm, mass percentage, volume percentage and mole fraction. (with Simple numerical),
UNIT-7: Water and Water Treatment (13 Periods)		
20th	4th	Graphical presentation of water distribution on Earth (pie or bar diagram). Classification as soft and hard water,
21st	1st	Causes of hardness, unit of hardness and simple numerical on water hardness and conversion.
	2nd	Cause of poor lathering of soap in hard water, problems caused by the use of hard water in boiler (scale and sludge, foaming and priming, corrosion etc.)
	3rd	Quantitative measurement of water hardness by EDTA method, total dissolved solids (TDS) alkalinity estimation.
	4th	Water softening techniques – soda lime process.
22nd	1st	Water softening techniques – zeolite process .
	2nd	Water softening techniques – ion exchange process .
	3rd	Municipal water treatment (in brief only) – sedimentation, coagulation.
	4th	Municipal water treatment (in brief only) – filtration, sterilization
UNIT-8: Engineering Materials (11 Periods)		
23rd	1st	Natural occurrence of metals – minerals, ores of iron, aluminium and copper, gangue
	2nd	Metallurgy – brief account of general principles of metallurgy.
	3rd	Alloys – definition, purposes of alloying, ferrous alloys and nonferrous with suitable
	4th	properties and applications of Brass, Bronze, Stainless Steel, Alnico, Duralumin
24th	1st	Polymers – monomer, homo and co polymers, degree of polymerization, addition
	2nd	Simple reactions involved in preparation and their application of thermoplastics and
	3rd	Simple reactions involved in preparation and their application of thermoplastics and
	4th	Simple reactions involved in preparation and their application of thermoplastics and
25th	1st	Simple reactions involved in preparation and their application of thermoplastics and
	2nd	Simple reactions involved in preparation and their application of thermoplastics and
	3rd	Rubber and vulcanization of rubber. Advantages of vulcanized rubber over natural rubber.
UNIT-9: Ecosystem (8 Periods)		
5	4th	Structure of ecosystem, Biotic & Abiotic components Food chain and food web

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26th	1st	Aquatic (Lentic and Lotic) and terrestrial ecosystem (grassland, forest, desert)
	2nd	Carbon, Nitrogen, Sulphur, Phosphorus cycle.
	3rd	Global warming -Causes, effects, process
	4th	Green House Effect, Ozone depletion.
27th	1st	Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air).
	2nd	Carbon, Nitrogen, Sulphur, Phosphorus cycle.
	3rd	Global warming -Causes, effects, process
	4th	Green House Effect, Ozone depletion.
UNIT-10: Renewable sources of Energy (13 Periods)		
28th	1st	Solar Energy: Basics of Solar energy. Flat plate collector (Liquid & Air).
	2nd	Theory of flat plate collector. Importance of coating. Advanced collector.
	3rd	Solar pond. Solar water heater
	4th	solar dryer, Solar stills
29th	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.
30th	1st	New Energy Sources: Need of new sources. Different types new energy sources.
	2nd	Applications of (Hydrogen energy, Tidal energy conversion.)
	3rd	Concept, origin and power plants of geothermal energy.
	4th	Wind energy: Future prospects of wind energy. Wind energy in India
31st	1st	Environmental benefits and problem of wind energy.
	2nd	New Energy Sources: Need of new sources. Different types new energy sources.
	3rd	Applications of (Hydrogen energy, Tidal energy conversion.)
	4th	Concept, origin and power plants of geothermal energy.
REVISION		
CLASS TEST		

Portions for 1st Internal Assessment - unit 1, unit 2 and Unit 3 Portion for 2nd Internal Assessment - unit 4 and Unit 5.

Portion for 3rd Internal assessment – Unit 6 to unit 10 Portion for End Examination - Unit 6 to unit 10

Learning Resources:

Sl. No.	Title of the Book	Name of the Author
1	Fundamental Concepts of Environmental Chemistry	G.S. Sodhi, Marisa, 2011.
2	A textbook of environmental chemistry and pollution control	Dr SS Dara and Dr DD Mishra, S. Chand, 2011
3	Environmental Pollution Analysis	S.M. Khopkar, New age international publishers, 2011
	Engineering Chemistry	Jain & Jain, Dhanpat Rai and Sons; New Delhi, 2015, ISBN 8187433175
	Chemistry of Engineers	Agnihotri, Rajesh, Wiley India Pvt. Ltd. 2014, ISBN 9788126550784
4	Engineering Chemistry	Shikha Agarwal, Cambridge University Press; New Delhi, 2015.

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Course Outcomes: After completion of the course, the students will be able :

CO1	Analyse real life problems associated with the ecosystem., Solve various engineering problems applying the basic concepts of atomic structure, chemical bonding and solutions.
CO2	Explain various types of pollution sources and its effect., Use relevant water treatment method to solve domestic and industrial problems.
CO3	Apply various types of pollution control mechanism to curb environmental pollution, Solve the engineering problems using concepts of engineering materials and properties.
CO4	Explain various sources of renewable energy and process of harnessing, Use relevant fuel and lubricants for domestic and industrial applications.
CO5	Explain solid waste management, ISO 14000 & Environmental management, Solve the engineering problems using concept of electrochemistry and corrosion.

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Lecturer in Chemistry

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