

BARGOAN INSTITUTE OF TECHNOLOGY (BIT)

Sundergarh, Odisha

LESSON PLAN FOR ACADEMIC SESSION

SUBJECT NAME:	Applied Chemistry & Environmental Science	COURSE CODE:	TH 3
DISCIPLINE:	All Branches	SEMESTER:	1st / 2nd Semester
PERIODS / WEEK:	04 Hours	TOTAL PERIODS:	128 Periods
PROGRESSIVE ASSMT:	30 Marks	END EXAM MARKS:	70 Marks (3 Hours)
NO. OF CREDITS:	4 Credits	FACULTY NAME:	_____

COURSE OUTCOMES (COS)

CO No.	Course Outcome Description
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.

SYLLABUS DISTRIBUTION & INTERNAL ASSESSMENT PORTIONS

Internal Assessment	Portion Covered	Final Exam Portion
1st Internal Assessment	Unit 1, Unit 2 and Unit 3	Unit 6 to Unit 10 (For Internal-3 and Final Examination)
2nd Internal Assessment	Unit 4 and Unit 5	
3rd Internal Assessment	Unit 6 to Unit 10	

WEEKLY LESSON EXECUTION PLAN

SL. NO.	WEEK	CLASS DATE	NO. OF CLASS	TOPICS PLANNED TO BE COVERED	FACULTY SIGN.
1	Week 1		4	UNIT-1: Air and Noise Pollution (10 Periods total) 1.1 Definition of pollution and pollutant, classification of pollutant (primary and secondary), Natural and man-made sources of air pollution.	
2	Week 2		4	1.2 Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator).	
3	Week 3		2	1.3 Gaseous Pollution Control: Catalytic Converter, Effects of air pollution due to Refrigerants, I.C. Engine, Boiler. 1.4 Noise pollution: Definition, sources of pollution, Effects and control of Noise Pollution.	
4	Week 3		2	UNIT-2: Water and Soil Pollution (12 Periods total) 2.1 Sources of water pollution, Types of water pollutants.	
5	Week 4		4	2.2 Characteristics of water pollutants: Turbidity, pH, total suspended solids, total solids, BOD and COD. 2.3 Waste Water Treatment: Primary methods (sedimentation, froth floatation).	
6	Week 5		4	2.3 (Contd.) Secondary methods (Activated sludge treatment, Bioreactor); Tertiary Method (Membrane separation technology, RO - reverse osmosis). 2.4 Soil Pollution: Definition, Causes, Effects and Preventive measures of Soil Pollution.	
7	Week 6		2	2.5 Effects of Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste on soil pollution.	

SL. NO.	WEEK	CLASS DATE	NO. OF CLASS	TOPICS PLANNED TO BE COVERED	FACULTY SIGN.
8	Week 6		2	UNIT-3: Solid Waste Management (10 Periods total) 3.0 Solid waste generation- Sources and characteristics of: Municipal solid waste, E-waste, Biomedical waste.	
9	Week 7		4	3.0 (Contd.) Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries. 3.1 Collection and disposal: MSW (3R principles, energy recovery, sanitary landfill), Hazardous waste.	
10	Week 8		4	3.2 Concept of Carbon Credit, Carbon Footprint. 3.3 Environmental management in fabrication industry.	
11	Week 9		4	UNIT-4: Electrochemistry & Corrosion (16 Periods total) 4.1 Electronic concept of oxidation, reduction and redox reactions. 4.2 Definition of terms: electrolytes, non-electrolytes with suitable examples.	
12	Week 10		4	4.3 Faraday's laws of electrolysis and simple numerical problems. 4.4 Industrial Application of Electrolysis - Electrometallurgy, Electroplating, Electrolytic refining.	
13	Week 11		4	4.5 Application of redox reactions in electrochemical cells – Primary cells (dry cell), Secondary cell (commercially used lead storage battery and fuel cells).	
14	Week 12		4	4.6 Introduction to Corrosion of metals - definition, types of corrosion (chemical and electrochemical), H_2 liberation and O_2 absorption mechanism of electrochemical corrosion, factors affecting rate of corrosion.	
15	Week 13		4	4.7 Internal corrosion preventive measures - Purification, alloying and heat treatment; External corrosion preventive measures: a) Metal (anodic, cathodic) coatings, b) Organic inhibitors.	
16	Week 14		4	UNIT-5: Chemistry of Fuels and Lubricants (14 Periods total) 5.1 Definition of fuel, classification of fuels, calorific values (HCV and LCV). 5.2 Liquid fuels petrol and diesel - fuel rating (octane and cetane numbers).	
17	Week 15		4	5.3 Chemical composition, calorific values and applications of LPG, CNG, water gas, coal gas, producer gas and biogas. 5.4 Lubricant – Definition, function, classification with examples.	
18	Week 16		4	5.5 Lubrication definition and mechanism (hydrodynamic and boundary lubrication). 5.6 Physical properties (viscosity & viscosity index, oiliness, flash & fire point, cloud & pour point only) and chemical properties (coke number, total acid number, saponification value) of lubricants, characteristic properties of good lubricant.	
19	Week 17		4	UNIT-6: Atomic Structure, Chemical Bonding and Solutions (21 Periods total) 6.1 Rutherford model of atom and its failures. 6.2 Bohr's theory (expression of energy and radius to be omitted) and hydrogen spectrum explanation based on Bohr's model of atom.	
20	Week 18		4	6.3 Quantum numbers – orbital concept. Shapes of s, p and d orbitals. 6.4 Pauli's exclusion principle, Heisenberg uncertainty principle, Aufbau principle, electronic configurations (up to atomic number 30), Hund's rule of maximum multiplicity.	
21	Week 19		4	6.5 Concept of chemical bonding – cause of chemical bonding, types of bonds: ionic bonding ($NaCl$ example), covalent bond (H_2 , F_2 , HF). 6.6 Basic concept of orbital overlapping sigma (σ) and pi (π) bonds, Concept of hybridization, hybridization in $BeCl_2$, BF_3 , CH_4 , NH_3 , H_2O .	
22	Week 20		4	6.7 Coordination bond in NH_4^+ , metallic bonding. 6.8 Hydrogen bond and anomalous properties of NH_3 , H_2O due to hydrogen bonding.	
23	Week 21		5	6.9 Solution – Idea of solute, solvent and solution, methods to express the concentration of solution: normality, molarity, molality, ppm, mass percentage, volume percentage and mole fraction (with simple numericals).	

SL. NO.	WEEK	CLASS DATE	NO. OF CLASS	TOPICS PLANNED TO BE COVERED	FACULTY SIGN.
24	Week 22		4	UNIT-7: Water and Water Treatment (13 Periods total) 7.1 Graphical presentation of water distribution on Earth (pie or bar diagram). Classification as soft and hard water. 7.2 Causes of hardness, unit of hardness and simple numerical on water hardness and conversion.	
25	Week 23		4	7.3 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.). 7.4 Quantitative measurement of water hardness by EDTA method, Total Dissolved Solids (TDS), alkalinity estimation.	
26	Week 24		5	7.5 Water softening techniques – Soda lime process, Zeolite process and Ion exchange process. 7.6 Municipal water treatment (in brief only) – Sedimentation, coagulation, filtration, sterilization.	
27	Week 25		4	UNIT-8: Engineering Materials (11 Periods total) 8.1 Natural occurrence of metals – Minerals, ores of iron, aluminium and copper, gangue (matrix) flux, slag. 8.2 Metallurgy – Brief account of general principles of metallurgy.	
28	Week 26		4	8.3 Alloys – Definition, purposes of alloying, ferrous alloys and nonferrous with suitable examples, properties and applications of Brass, Bronze, Stainless Steel, Alnico, Duralumin. 8.4 Polymers – Monomer, homo and co-polymers, degree of polymerization, addition polymerization and condensation polymerization.	
29	Week 27		3	8.5 Simple reactions involved in preparation and application of thermoplastics and thermosetting plastics (using PVC, PS, PTFE, Nylon-6, Nylon-6,6 and Bakelite). 8.6 Rubber and vulcanization of rubber. Advantages of vulcanized rubber over natural rubber.	
30	Week 28		4	UNIT-9: Ecosystem (8 Periods total) 9.1 Structure of ecosystem, Biotic & Abiotic components, Food chain and food web. 9.2 Aquatic (Lentic and Lotic) and Terrestrial ecosystem (grassland, forest, desert).	
31	Week 29		4	9.3 Carbon, Nitrogen, Sulphur, Phosphorus cycle. 9.4 Global warming – Causes, effects, process, Green House Effect, Ozone depletion.	
32	Week 30		4	UNIT-10: Renewable Sources of Energy (13 Periods total) 10.1 Solar Energy: Basics of solar energy. Flat plate collector (Liquid & Air). Theory of flat plate collector. Importance of coating. Advanced collector. Solar pond. Solar water heater, solar dryer. Solar stills.	
33	Week 31		4	10.2 Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. 10.3 Anaerobic digestion. Biogas production mechanism and Utilization. 10.4 Wind energy: Future prospects of wind energy. Wind energy in India. Environmental benefits and problem of wind energy.	
34	Week 32		5	10.5 New Energy Sources: Need of new sources. Different types new energy sources. Applications of (Hydrogen energy, Tidal energy conversion.) Concept, origin and power plants of geothermal energy.	

SUGGESTED LEARNING RESOURCES / REFERENCE BOOKS

1. **Applied Chemistry** by Dr. Anju Rawlley (Download from <https://ekumbh.aicte-india.org/dbook.php>)
2. **Text Book of Chemistry for Class XI & XII (Part-I, Part-II)**; N.C.E.R.T., Delhi, 2017-18.
3. **Agarwal, & Shikha**, *Engineering Chemistry*, Cambridge University Press; New Delhi, 2015.
4. **C.N. R. Rao**, *Understanding Chemistry*, Universities Press (India) Pvt. Ltd., 2011.
5. **Dara, S.S. & Dr. S.S. Umare**, *Engineering Chemistry*, S. Chand. Publication, New Delhi, 2015.
6. **Jain & Jain**, *Engineering Chemistry*, Dhanpat Rai and Sons; New Delhi, 2015.
7. **Dr. Vairam, S.**, *Engineering Chemistry*, Wiley India Pvt. Ltd., New Delhi, 2013.
8. **Environmental Science (English)** by Dr. Subrat Roy (Download from AICTE e-KUMBH).
9. **S.C. Sharma & M.P. Poonia**, *Environmental Studies*, Khanna Publishing House, New Delhi.
10. **O.P. Gupta**, *Elements of Environmental Pollution Control*, Khanna Publishing House, New Delhi.

Signature of Faculty Member

Date: _____

Signature of HOD / Principal

Date: _____