

MECHANICAL ENGINEERING

SEC (A)

1st Year

FROM :17/08/2026 TO :17/04/2027

NAME OF THE FACULTY : Mr. RAMANATH MOHAPATRA

SUBJECT : Applied Chemistry and Environmental Science

TOTAL CLASS AVAILABLE IN SEMESTER: 128 nos

NO. OF PERIODS : 04/ WEEK

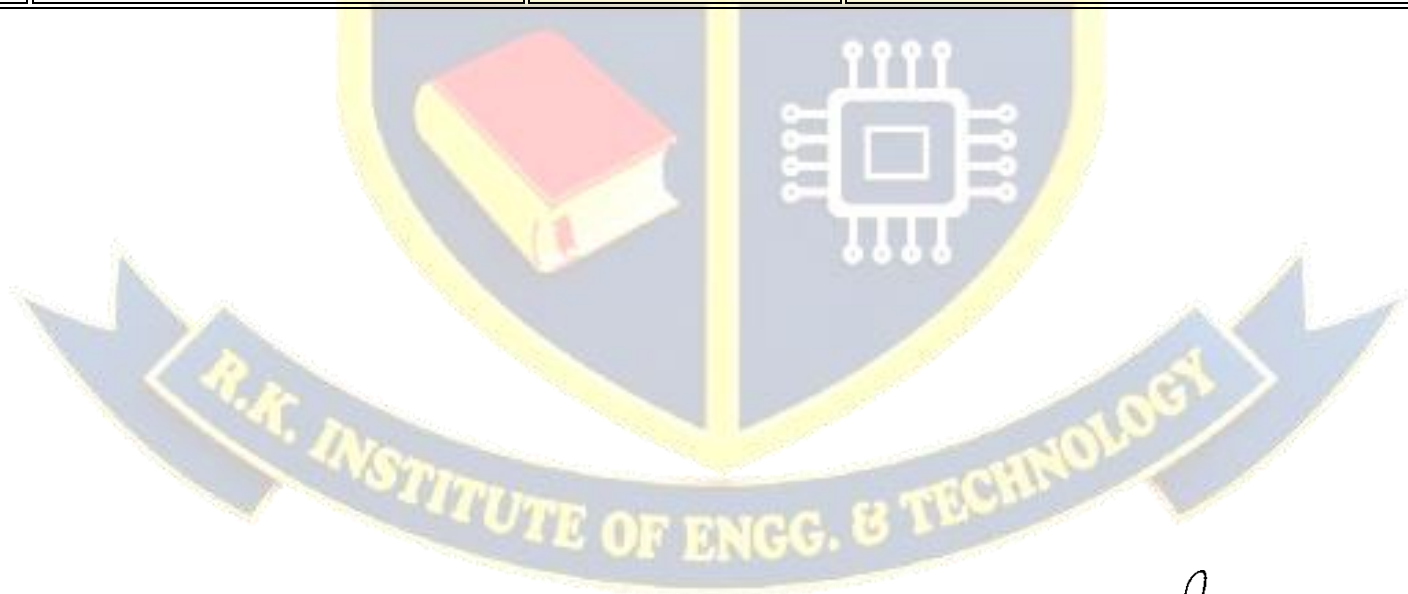
Class	Topic	Teaching Method	Learning Outcome
1	Introduction to Environment, Pollution and Pollutants	Lecture	Define pollution and classify pollutants.
2	Primary and Secondary Pollutants	Lecture with PPT	Differentiate primary and secondary pollutants.
3	Natural and Man-made Sources of Air Pollution	Lecture & Discussion	Identify sources of air pollution.
4	Types of Air Pollutants	Lecture	Classify particulate and gaseous pollutants.
5	Particulate Pollutants: Effects and Control	Lecture with Charts	Explain effects and control of particulate pollutants.
6	Bag Filter, Cyclone Separator & Electrostatic Precipitator	Demonstration	Explain the working of air pollution control devices.
7	Gaseous Pollution Control: Catalytic Converter	Lecture	Explain gaseous pollution control techniques.
8	Air Pollution due to Refrigerants, I.C. Engines & Boilers	Lecture	Describe industrial sources of air pollution.
9	Noise Pollution: Sources, Effects & Control	Lecture + Discussion	Explain causes, effects and preventive measures of noise pollution.
10	Unit-I Revision & Class Test	Quiz	Apply concepts of air and noise pollution.
11	Sources of Water Pollution	Lecture	Identify sources of water pollution.
12	Types of Water Pollutants	Lecture	Classify water pollutants.
13	Water Quality Parameters: Turbidity & pH	Lecture	Explain important water quality parameters.
14	Total Solids, TSS, BOD & COD	Lecture + Numerical	Interpret water quality indicators.
15	Wastewater Treatment: Primary Treatment	Lecture with Flow Chart	Explain sedimentation and froth flotation.
16	Secondary Treatment: Activated Sludge & Bioreactor	Lecture	Explain biological wastewater treatment.
17	Tertiary Treatment: Membrane Separation & RO	Lecture	Describe advanced water treatment methods.
18	Soil Pollution: Definition, Causes & Effects	Lecture	Explain soil pollution and its impact.

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19	Prevention of Soil Pollution	Discussion	Suggest preventive measures.
20	Fertilizers, Pesticides & Insecticides	Lecture	Explain their effects on soil.
21	Irrigation & E-Waste and Soil Pollution	Lecture	Describe environmental impacts of e-waste.
22	Unit-II Revision & Test	Quiz	Apply concepts of water and soil pollution.
23	Introduction to Solid Waste	Lecture	Define and classify solid waste.
24	Municipal Solid Waste	Lecture	Explain characteristics of municipal waste.
25	E-Waste and Biomedical Waste	Lecture	Identify hazardous solid wastes.
26	Industrial Metallic and Non-metallic Waste	Lecture	Classify industrial wastes.
27	Collection and Disposal of MSW	Lecture	Explain solid waste collection methods.
28	3R Principles	Discussion	Apply Reduce, Reuse and Recycle principles.
29	Energy Recovery & Sanitary Landfill	Lecture	Explain scientific disposal methods.
30	Hazardous Waste Management	Lecture	Describe hazardous waste handling.
31	Carbon Credit & Carbon Footprint	Lecture	Explain carbon management concepts.
32	Environmental Management in Fabrication Industry & Unit Test	Discussion	Apply environmental management practices.
33	Oxidation, Reduction & Redox Reactions	Lecture	Explain redox reactions.
34	Electrolytes & Non-Electrolytes	Lecture	Differentiate electrolytes and non-electrolytes.
35	Faraday's First Law	Lecture + Numerical	Apply Faraday's first law.
36	Faraday's Second Law	Lecture + Numerical	Solve numerical problems on electrolysis.
37	Electrometallurgy	Lecture	Explain industrial applications of electrolysis.
38	Electroplating	Lecture + Demonstration	Describe electroplating process.
39	Electrolytic Refining	Lecture	Explain electrolytic refining.
40	Primary Cells (Dry Cell)	Lecture	Explain construction and working of dry cells.
41	Secondary Cells (Lead Storage Battery)	Lecture	Explain lead storage batteries.
42	Fuel Cells	Lecture	Explain fuel cell technology.
43	Introduction to Corrosion	Lecture	Define corrosion and its types.
44	Chemical & Electrochemical Corrosion	Lecture	Differentiate corrosion mechanisms.
45	Factors Affecting Corrosion	Lecture	Explain factors influencing corrosion.
46	Internal Corrosion Prevention	Lecture	Describe purification, alloying and heat treatment.
47	External Corrosion Prevention	Lecture	Explain coatings and inhibitors.
48	Revision & Unit Test	Quiz	Apply electrochemistry and corrosion concepts.
49	Introduction to Fuels	Lecture	Define fuels and classify them.
50	Calorific Value (HCV & LCV)	Lecture + Numerical	Calculate calorific values.
51	Petrol and Diesel	Lecture	Explain properties of liquid fuels.
52	Octane and Cetane Number	Lecture	Differentiate octane and cetane ratings.

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53	LPG and CNG	Lecture	Explain composition and applications.
54	Water Gas, Coal Gas & Producer Gas	Lecture	Compare gaseous fuels.
55	Biogas	Lecture + Video	Explain production and uses of biogas.
56	Introduction to Lubricants	Lecture	Define lubricants and their functions.
57	Classification of Lubricants	Lecture	Classify lubricants with examples.
58	Hydrodynamic & Boundary Lubrication	Lecture	Explain lubrication mechanisms.
59	Physical Properties of Lubricants	Lecture	Describe viscosity and flash point.
60	Chemical Properties of Lubricants	Lecture	Explain acid number and saponification value.
61	Characteristics of Good Lubricants	Discussion	Select suitable lubricants for engineering applications.
62	Revision & Unit Test	Quiz	Apply concepts of fuels and lubricants.
63	Introduction to Atomic Structure	Lecture	Explain the basic concept of atomic structure.
64	Rutherford's Atomic Model and its Limitations	Lecture	Describe Rutherford's model and its limitations.
65	Bohr's Atomic Theory	Lecture	Explain Bohr's atomic model.
66	Hydrogen Spectrum based on Bohr's Theory	Lecture	Explain the hydrogen spectrum using Bohr's theory.
67	Quantum Numbers	Lecture	Define and explain the four quantum numbers.
68	Orbital Concept and Shapes of s, p and d Orbitals	Lecture with Charts	Identify orbital shapes.
69	Pauli Exclusion Principle	Lecture	Explain Pauli's exclusion principle.
70	Heisenberg Uncertainty Principle	Lecture	Explain the uncertainty principle.
71	Aufbau Principle	Lecture	Apply Aufbau principle for electronic configuration.
72	Hund's Rule and Electronic Configuration ($Z \leq 30$)	Lecture + Practice	Write electronic configurations correctly.
73	Introduction to Chemical Bonding	Lecture	Explain the need for chemical bonding.
74	Ionic Bonding (NaCl)	Lecture	Explain ionic bond formation.
75	Covalent Bonding (H_2 , F_2 , HF)	Lecture	Describe covalent bond formation.
76	Sigma and Pi Bonds	Lecture	Differentiate sigma and pi bonds.
77	Hybridization ($BeCl_2$, BF_3)	Lecture	Explain sp and sp^2 hybridization.
78	Hybridization (CH_4 , NH_3 , H_2O)	Lecture	Explain sp^3 hybridization.
79	Coordination Bond, Metallic Bond and Hydrogen Bond	Lecture	Explain different types of chemical bonds.
80	Anomalous Properties of NH_3 and H_2O	Discussion	Relate hydrogen bonding to physical properties.
81	Solutions: Solute, Solvent and Concentration Terms	Lecture	Explain solution terminology.
82	Concentration Methods (Molarity, Molality, Normality, ppm etc.)	Lecture + Numerical	Calculate concentration of solutions.
83	Revision & Unit Test	Quiz	Apply concepts of atomic structure and solutions.

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84	Distribution of Water on Earth	Lecture	Explain global water distribution.
85	Soft Water and Hard Water	Lecture	Differentiate soft and hard water.
86	Causes and Units of Hardness	Lecture + Numerical	Calculate hardness of water.
87	Problems Caused by Hard Water	Lecture	Explain boiler troubles due to hard water.
88	Scale, Sludge, Foaming and Priming	Lecture	Describe boiler-related problems.
89	EDTA Method for Hardness Measurement	Lecture	Explain EDTA method.
90	Total Dissolved Solids (TDS) and Alkalinity	Lecture	Explain TDS and alkalinity.
91	Soda Lime Process	Lecture	Explain water softening by soda lime process.
92	Zeolite Process	Lecture	Explain zeolite process.
93	Ion Exchange Process	Lecture	Explain ion exchange process.
94	Municipal Water Treatment	Lecture	Describe municipal water treatment steps.
95	Applications of Water Treatment	Discussion	Select suitable water treatment methods.
96	Revision & Unit Test	Quiz	Apply concepts of water treatment.
97	Minerals, Ores and Gangue	Lecture	Differentiate minerals, ores and gangue.
98	Flux, Slag and Metallurgy	Lecture	Explain metallurgical terminology.
99	General Principles of Metallurgy	Lecture	Explain extraction of metals.
100	Alloys and Purpose of Alloying	Lecture	Explain alloy formation.
101	Ferrous and Non-ferrous Alloys	Lecture	Compare ferrous and non-ferrous alloys.
102	Brass, Bronze, Stainless Steel, Alnico and Duralumin	Lecture	Explain properties and applications of important alloys.
103	Polymers: Monomer, Homopolymer and Copolymer	Lecture	Classify polymers.
104	Addition and Condensation Polymerization	Lecture	Explain polymerization processes.
105	Thermoplastics and Thermosetting Plastics	Lecture	Differentiate thermoplastics and thermosetting plastics.
106	Rubber and Vulcanization	Lecture	Explain vulcanization and its advantages.
107	Revision & Unit Test	Quiz	Apply concepts of engineering materials.
108	Structure of Ecosystem	Lecture	Explain ecosystem structure.
109	Biotic and Abiotic Components	Lecture	Differentiate ecosystem components.
110	Food Chain and Food Web	Lecture + Diagram	Explain energy flow in ecosystems.
111	Aquatic Ecosystem (Lentic & Lotic)	Lecture	Compare aquatic ecosystems.
112	Terrestrial Ecosystem	Lecture	Explain grassland, forest and desert ecosystems.
113	Carbon, Nitrogen, Sulphur and Phosphorus Cycles	Lecture	Explain major biogeochemical cycles.
114	Global Warming, Greenhouse Effect and Ozone Depletion	Lecture + Video	Explain causes and environmental impacts.
115	Revision & Unit Test	Quiz	Apply ecosystem concepts to environmental issues.
116	Introduction to Renewable Energy	Lecture	Explain the need for renewable energy.

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117	Solar Energy Basics	Lecture	Describe solar energy principles.
118	Flat Plate Collectors	Lecture	Explain the construction and working of flat plate collectors.
119	Advanced Solar Collectors and Solar Pond	Lecture	Describe advanced solar technologies.
120	Solar Water Heater, Solar Dryer and Solar Stills	Lecture	Explain solar energy applications.
121	Biomass as an Energy Source	Lecture	Explain biomass energy conversion.
122	Thermal Characteristics of Biomass	Lecture	Describe biomass fuel properties.
123	Anaerobic Digestion and Biogas Production	Lecture	Explain biogas production and utilization.
124	Wind Energy and Wind Energy in India	Lecture	Explain wind energy generation and its prospects.
125	Environmental Benefits and Problems of Wind Energy	Discussion	Evaluate advantages and limitations of wind energy.
126	Hydrogen Energy and Tidal Energy	Lecture	Explain emerging renewable energy sources.
127	Geothermal Energy	Lecture	Explain geothermal energy and power plants.
128	Revision, Comprehensive Review & Final Assessment	Discussion, Problem Solving & Test	Integrate concepts of renewable energy and environmental science for engineering applications.




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