GOVERNMENT POLYTECHNIC, KANDHAMAL

DEPARTMENT OF MATHEMATICS & SCIENCE

LESSON PLAN
ENVIRONMENTAL SCIENCE (THEORY)
FOR
1ST SEMESTER
(BRANCH: COMMON)
(SESSION: 2025 – 26)

PREPARED BY
Gouranga Badhei
Sr. Lecturer in Chemistry

NAME OF THE COURSE: ENVIRONMENTAL SCIENCE			
COURSE CODE	Th 5	SEMESTER	1st Sem.
THEORY PERIODS	4 Periods/Week	END EXAMINATION	3 Hrs
TOTAL HOURS	60	INTERNAL ASSESSMENT TEST	30 Marks
END SEMESTER EXAMINATION	70 Marks	NO. OF CREDITS	4

Syllabus Coverage up to1st Internal Examination

Unit-1 & 2

Course Outcome

After Completion of the Course the Students will be able to:

CO-1: Analyze real life problems associated with the ecosystem.
CO-2: Explain various types of pollution sources and their effect.
CO-3: Apply various types of pollution control mechanism to curb environmental pollution.
CO-4: Explain various sources of renewable energy and the process of harnessing.
CO-5: Explain solid waste management, ISO 14000 & Environmental management.

Course Content:

Unit-1 Ecosystem

Structure of ecosystem, Biotic & Abiotic components Food chain and food web

Aquatic (Lentic and Lotic) and terrestrial ecosystem Carbon, Nitrogen, Sulphur, Phosphorus cycle.

Global warming -Causes, effects, process, Green House Effect, Ozone depletion

Unit– 2 Air and, Noise Pollution

Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)

Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)

Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler

Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000

Unit- 3 Water and Soil Pollution

Sources of water pollution, Types of water pollutants, Characteristics of water pollutants: Turbidity, pH, total suspended solids, total solids BOD and COD: Definition, calculation

Waste Water Treatment: Primary methods: sedimentation, froth floatation, Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor, Tertiary Method: Membrane separation technology, RO (reverse osmosis).

Causes, Effects and Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.

Unit– 4 Renewable sources of Energy

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.

Biomass: Overview of biomass as energy source, Thermal characteristics of biomass as fuel, anaerobic digestion, Biogas production mechanism, Utilization and storage of biogas.

Wind energy: Current status and future prospects of wind energy, Wind energy in India, Environmental benefits and problem of wind energy.

New Energy Sources: Need of new sources, Different types of new energy sources, Applications of (Hydrogen energy, Ocean energy resources, Tidal energy conversion.) Concept, origin and power plants of geothermal energy

Unit-5 Solid Waste Management, ISO 14000 & Environmental Management

Solid waste generation- Sources and characteristics of : Municipal solid waste, E- waste, bio-medical waste.

Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.

Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste.

Air quality act 2004, air pollution control act 1981 and water pollution and control act1996.

Structure and role of Central and state pollution control board.

Concept of Carbon Credit, Carbon Footprint. Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.

References/Suggested Learning Resources:

(a) Books:

1. Environmental Science (English) by Dr. Subrat Roy (Download from https://ekumbh.aicte-india.org/dbook.php)
2. S.C. Sharma & M.P. Poonia, Environmental Studies,Khanna Publishing House,NewDelhi
3. C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.
4. Arceivala, Soli Asolekar, Shyam, Waste Water Treatment for Pollution Control and Reuse, Mc-Graw Hill Education India Pvt. Ltd., New York, 2007, ISBN:978-07-062099
5. Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940
6. O.P. Gupta, Elements of Environmental Pollution Control, Khanna Publishing House, New Delhi
7. Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
8. Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New delhi, 1988, ISBN: 0-07- 451871-8.
9. Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.

(b) Open-source software and website address:

1. www.eco-prayer.org
2. www.teriin.org
3. www.cpcp.nic.in
4. www.cpcp.gov.in
5. www.indiaenvironmentportal.org.in
6. www.whatis.techtarget.com
7. www.sustainabledevelopment.un.org
8. www.conserve-energy-future.com

LESSON PLAN
Session: 2025 – 26 (Winter)

Course Name : Environmental Science	**Name of the Faculty:** Gouranga Badhei, Sr. Lecturer (Chemistry)
Course Code : Th 5 (a)	
Semester : 1st Semester (odd)	**Session** : Winter 2025-26
Periods/Week : 04	**Date** : 06-08-2025 to 04-12-2025
Total Periods : 60	**No of Credits** :4

Week	Class/Day	Topics to be Covered
1	1	**Unit-1:** Structure of ecosystem, Biotic & Abiotic components Food chain and food web
	2	Aquatic (Lentic and Lotic), Terrestrial ecosystem
	3	Carbon Cycle, Nitrogen Cycle
	4	Sulphur cycle, Phosphorus cycle.
2	1	Global warming -Causes, effects, process, Green House Effect, Ozone depletion
	2	**Unit-2:** Definition of pollution and pollutant, Natural sources of air pollution
	3	Manmade sources of air pollution (Refrigerants, I.C., Boiler)
	4	Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator)
3	1	Gaseous Pollution Control: Absorber, Catalytic Converter,
	2	Effects of air pollution due to Refrigerants, I.C., Boiler
	3	Noise pollution: sources of pollution, measurement of pollution level,
	4	Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000
4	1	**DOUBT CLEARANCE CLASS**
	2	**1st Internal Test**
	3	**Unit-3:** Sources of water pollution, Types of water pollutants, Characteristics of water pollutants: Turbidity, pH
	4	Total suspended solids, total solids, BOD and COD: Definition, calculation
5	1	Waste Water Treatment: Primary methods: sedimentation, froth floatation,
	2	Secondary methods: Activated sludge treatment, Trickling filter, Bioreactor
	3	Tertiary Method: Membrane separation technology, RO (reverse osmosis).
	4	Soil Pollution: Causes and Effects of soil pollution
6	1	Preventive measures of Soil Pollution: Causes-Excessive use of Fertilizers, Pesticides and Insecticides, Irrigation, E-Waste.
	2	**DOUBT CLEARANCE CLASS**
	3	**Unit-4:** Solar Energy: Basics of Solar energy, Flat plate collector (Liquid & Air), Theory of flat plate collector.
	4	Importance of coating, advanced collector, solar pond,
7	1	Solar water heater, solar dryer, Solar stills.
	2	Biomass: Overview of biomass as energy source,
	3	Thermal characteristics of biomass as fuel, Anaerobic digestion

	4	Biogas production mechanism, Utilization and storage of biogas.
8	1	Wind energy: Current status and future prospects of wind energy
	2	Wind energy in India
	3	Environmental benefits and problems of wind energy.
	4	New Energy Sources: Need of new sources, Different types of new energy sources
9	1	Applications of Hydrogen energy
	2	Applications of Ocean energy resources, Tidal energy conversion.
	3	Concept, origin and power plants of geothermal energy
	4	**DOUBT CLEARANCE CLASS**
10	1	**Unit-5:** Solid waste generation- Sources and characteristics of: Municipal solid waste,
	2	Sources and characteristics of E- waste,
	3	Sources and characteristics of bio-medical waste.
	4	Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.
11	1	Collection and disposal: MSW 3R principles,
	2	energy recovery, sanitary landfill,
	3	Hazardous waste.
	4	Air quality act 2004
12	1	Air pollution control act 1981 and water pollution and control act 1996.
	2	Structure and role of Central and state pollution control board.
	3	Concept of Carbon Credit, Carbon Footprint.
	4	Environmental management in fabrication industry. ISO14000: Implementation in industries, Benefits.
13	1	**DOUBT CLEARANCE CLASS**
	2	REVISION OF UNIT-1
	3	REVISION OF UNIT-1
	4	REVISION OF UNIT-2
14	1	REVISION OF UNIT-2
	2	REVISION OF UNIT-3
	3	REVISION OF UNIT-3
	4	REVISION OF UNIT-4
15	1	REVISION OF UNIT-4
	2	REVISION OF UNIT-5
	3	REVISION OF UNIT-5
	4	**2nd Internal Test**

Course Beyond Syllabus:

Unit	Topics beyond Syllabus
1	Ecological pyramids
	Ecological succession
	Water cycle
	Acid rain
2	Bio-degradable pollutants, non-biodegradable pollutants
	Primary and secondary pollutants
	Pathways of pollutants, receptor of pollutants
3	Lime soda process (cold and Hot)
	Ion exchange process
4	Energy cropping
	Petro plants
5	Industrial waste management
	On-site disposal options and off-site disposal options

Signature of the Faculty

30-7-25

Academic coordinator

30/07/25

Signature of HOD