Program : **Diploma in Engineering and Technology / Commercial Practice / Management**	
Course Code : **2001**	Course Title: **Environmental Science**
Semester : **2**	Credits: **No Credit**
Course Category: **Common Course**	
Periods per week: **3 (L:2 T:1 P:0)**	Periods per semester: **45**

Course Objectives:

- To impart essential knowledge about ecosystem
- To provide a detailed understanding of problems affecting the ecosystem
- To enable the student to arrive at solutions to such problems making use of his technical skills
- To provide an awareness about renewable energy resources, efficient process of energy harvesting and solid waste management

Course Prerequisites:

Topic	Course Code	Course Name	Semester
Basic Knowledge in Chemistry		Applied Chemistry	1

Course Outcomes

On completion of the course, the student will be able to:

COn	Description	Duration (Hours)	Cognitive Level
CO1	Explain the ecosystem and terminology involved in it	10	Understanding
CO2	Explain air, water, soil and noise pollution, and control measures and acts.	11	Understanding
CO3	Explain different renewable energy resources and efficient process of harvesting.	9	Understanding

CO4	Explain solid Waste Management, ISO 14000 & Environmental Management and conduct a case study on any one environmental problem / application of sustainable energy resources	13	Understanding
	Series Test	2	

CO-PO Mapping

Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7
CO1							
CO2					2		
CO3					3		
CO4						3	3

3- strongly mapped, 2-moderately mapped, 1-weakly mapped

Course Outline

Module Outcomes	Description	Duration (Hours)	Cognitive Level
CO1	**Explain the ecosystem and terminology involved in it**		
M1.01	Structure of ecosystem, Biotic & Abiotic components	1	Understanding
M1.02	Food chain and food web	1	Understanding
M1.03	Aquatic (Lentic and Lotic) and terrestrial ecosystem	1	Understanding
M1.04	Carbon, Nitrogen, Sulphur, Phosphorus cycle.	4	Understanding
M1.05	Global Warming-Causes, effects, process, Green House Effect, Ozone depletion	3	Understanding

Contents:

Structure of ecosystem, ecological pyramid, 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, GreenHouse Effect, Ozone depletion, acid rain

CO2	**Explain air, water, soil and noise pollution, and control measures and acts.**		
M2.01	Definition of pollution and pollutant, Natural and manmade sources of air pollution (Refrigerants, I.C., Boiler)	3	Understanding
M2.02	Air Pollutants: Types, Particulate Pollutants: Effects and control (Bag filter, Cyclone separator, Electrostatic Precipitator) Air quality standards Gaseous Pollution Control: Absorber, Catalytic Converter, Effects of air pollution due to Refrigerants, I.C., Boiler	3	Understanding
M2.03	Water pollution: Sources and effect-important water quality parameters, pH, DO, BOD, COD	3	Understanding
M2.04	Noise pollution: sources of pollution, measurement of pollution level, Effects of Noise pollution, Noise pollution (Regulation and Control) Rules, 2000	2	Understanding
	Series Test 1	1	

Contents:

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

Water pollution: Sources and effect-important water quality parameters, pH, DO, BOD, COD.

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

CO3	**Explain different renewable energy resources and efficient process of harvesting**		
M3.01	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.	2	Understanding

M3.02	Biomass: Overview of biomass as energy source. Thermal characteristics of biomass as fuel. Anaerobic digestion. Biogas production mechanism. Utilization and storage of biogas	2	Understanding
M3.03	Wind energy: Current status and future prospects of wind energy. Wind energy in India. Environmental benefits and the problem of wind energy.	2	Understanding
M3.04	New Energy Sources: Need for 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	3	Understanding

Contents:

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 the problem of wind energy.

New Energy Sources: Need for 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

CO4	**Explain solid Waste Management, ISO 14000 & Environmental Management.**		
M4.01	Solid waste generation- Sources and characteristics of: Municipal solid waste, E-waste, biomedical waste.	2	Understanding
M4.02	Metallic wastes and Non-Metallic wastes (lubricants, plastics, rubber) from industries.	2	Understanding
M4.03	Collection and disposal: MSW (3R, principles, energy recovery, sanitary landfill), Hazardous waste	2	Understanding
M4.04	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.	1	Understanding

M4.05	Concept of Carbon Credit, Carbon Footprint.	1	Understanding
M4.06	Environmental management in fabrication industry	1	Understanding
M4.07	ISO14000: Implementation in industries, Benefits.	1	Understanding
M4.08	Case Study **	3	
	Series Test	1	

Contents :

Solid waste generation- Sources and characteristics of: Municipal solid waste, E- waste, biomedical 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 the fabrication industry.

ISO14000: Implementation in industries, Benefits.

** Suggested Case Study

Not for End Semester Examination, but compulsory to be included in Continuous Internal Evaluation. Students can do case study as a group of 4-5. There should not be any duplication of experiments between groups. Each member of the group should submit their group report individually.

Sample Case Study

1. Engineering solution relevant to an environmental problem caused by any of the pollutions, solid waste disposal etc
2. study on sustainable energy resources giving importance to its application

Text / Reference:

T/R	Book Title/Author
1	C.N. R. Rao, Understanding Chemistry, Universities Press (India) Pvt. Ltd., 2011.

2	Nazaroff, William, Cohen, Lisa, Environmental Engineering Science, Willy, New York, 2000, ISBN 10: 0471144940.
3	Rao, C. S., Environmental Pollution Control and Engineering, New Age International Publication, 2007, ISBN: 81-224-1835-X.
4	Rao, M. N.Rao, H.V.N, Air Pollution, Tata Mc-Graw Hill Publication, New Delhi, 1988, ISBN: 0-07-451871-8.
5	Frank Kreith, Jan F Kreider, Principles of Solar Engineering, McGraw-Hill, New York ; 1978, ISBN: 9780070354760.
6	Aldo Vieira, Da Rosa, Fundamentals of renewable energy processes, Academic Press Oxford, UK; 2013. ISBN: 9780123978257.
7	Patvardhan, A.D, Industrial Solid Waste, Teri Press, New Delhi, 2013, ISBN:978-81-7993- 502-6
8	Metcalf & Eddy, Waste Water Engineering, Mc-Graw Hill, New York, 2013, ISBN: 077441206.

Online resources

Sl. No	Website Link
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	https://sdgs.un.org
7	www.conserve-energy-future.com