Subject Code: ME121	Course Title: Environmental Science	Total Contact Hours: 14	L: 1	T: 0	P: 0	C: 1
Pre-requisite: Nil		Year: 1st	**Semester**: Even			
Type of Course: Mandatory course (MC)						

***** L → Lectures, T → Tutorials, P → Practical C → Credit***

Learning Objective:

Through this course students will be able to understand core concepts and methods from ecological and environmental sciences and their application in environmental problem-solving. This course deals with the understanding of the importance of energy resources, natural components of environmental media (air, water, soil) and pollution. Application of the fundamental principles of sciences to mitigate the effects of pollution and to waste management through sustainable approaches. This course seeks to create a learning environment in which our students would be made aware of the importance of environmental studies and environmental issues in the larger social context and may be encouraged to take up higher studies in this discipline.

Course outcomes (COs):

On completion of this course, the students will have the ability to:		Bloom's Level
S. No.	**Course Outcomes**	
CO1	Learn the mechanisms and functioning of natural ecosystems and role of biodiversity.	**L1**
CO2	Explore the relationship between environmental pollution and their impacts on human and environmental health.	**L4**
CO3	Discuss the sustainable approaches for the remediation of environmental degradation.	**L2**
CO4	Understand the nature of environmental problems, various forms of environmental degradation, social issues, and sustainable development	**L2**

Topics	Contact Hours	COs
The Multidisciplinary nature of environmental studies: Definition, Scope, and importance of Environmental Science.	1	CO1
Natural Resources: Renewable and non-renewable resources - Energy Resources and associated problems: case studies Equitable use of resources for sustainable lifestyles.	2	CO1
Ecology and Biodiversity: Basic concept of ecosystem ecology. Type, structure, and function of ecosystems. Energy flows into ecosystems, food chains and food webs. Ecosystem services, Biogeochemical cycles. Biodiversity: Introduction to genetic, species and ecosystem diversity. Value of biodiversity. Threats to biodiversity, Strategies for biodiversity conservation: in situ, ex situ and in vitro conservation.	3	CO2
Environmental pollution and human health: Introduction, causes, impacts and control strategies of environmental pollution (Air pollution, Water pollution, Soil pollution, Radioactive pollution). Pollution case studies: Ganga Action plan (GAP), Delhi air pollution and public health issues.	3	CO2
Waste management and sustainable development: Introduction, scope, and importance of waste management. Wastewater management: wastewater characteristics, biological wastewater treatment process, and disinfection. Solid waste management: municipal solid waste, battery waste, e-waste, and plastic waste. Concept of sustainable development.	3	CO3
Social issues and Environmental protection laws: Global warming, Climate change, Acid rain, Ozone layer depletion. Environment Protection Acts, Role of NGT in environmental governance, Current national initiatives on environmental interventions like NCAP, National River conservation plans.	2	CO4

Textbook references:

1. Odum, E.P. (1971) Fundamentals of Ecology.
2. Erach Bharucha: Textbook of Environmental Studies.
3. Environmental Science, Anubha Kaushik, C.P. Kaushik, New Age International (P) Limited, 2011.
4. Environmental Studies, Benny Joseph, 3rd Addition, McGraw Hill Education (India) Private Limited, 2018.

Reference Book

1. Metcalf & Eddy Inc., Tchobanoglous, G., Burton, F. L., Tsuchihashi, R., & Stensel, H. D. (2013). Wastewater engineering: Treatment and resource recovery (5th ed.). McGraw-Hill Professional
2. Mark Burgman., Risks and Decisions for Conservation and Environmental Management (Ecology, Biodiversity and Conservation). Cambridge University Press.

Additional resources:

NPTEL, Video Lectures, Web Resources etc.

Evaluation Criteria:

It will be shared in the first class.

CO and PO Correlation Matrix

S. No.	Course Outcomes (CO)	POs	ME PSO's	ECE PSO's	CSE PSO's	CCE PSO's
CO1	Learn the mechanisms and functioning of natural ecosystems and role of biodiversity.	1, 7, 12	2	2	-	-
CO2	Explore the relationship between environmental pollution and their impacts on human and environmental health.	1, 6, 7, 12	-	-	-	-
CO3	Discuss the sustainable approaches for the remediation of environmental degradation.	1, 2, 6, 7	2	2	-	-
CO4	Understand the nature of environmental problems, various forms of environmental degradation, social issues, and sustainable development.	1, 2, 6, 7, 12	2	2	-	-

CO and PO-PSO Correlation Matrix

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	**1**	-	-	-	-	-	**2**	-	-	-	-	**1**	-	**1**	-
CO2	**1**	-	-	-	-	**1**	**3**	-	-	-	-	**2**	-	-	-
CO3	**1**	**1**	-	-	-	**2**	**2**	-	-	-	-	-	-	**1**	-
CO4	**1**	**1**	-	-	-	**1**	**2**	-	-	-	-	**2**	-	**1**	-

Last update: December 29, 2023

Updated by: **Approved by:**

Dr. Sandeep Singh Shekhawat

CO-PO Mapping Justification

CO1 serves as a foundation for applying engineering knowledge to solve complex problems, understanding the impact of engineering solutions on societal and environmental contexts, and recognizing the need for life-long learning. CO1 aligns to PO1 by providing a foundational understanding of natural ecosystems and biodiversity, fostering knowledge in natural sciences and engineering fundamentals. CO1 supports PO7 by emphasizing the understanding of the impact of professional engineering solutions in societal and environmental contexts. CO1 contributes PO12 by instilling the recognition of the need for continuous learning. The study of natural ecosystems is dynamic, requiring engineers to engage in life-long learning to stay informed about technological advancements and evolving ecological knowledge.

CO2 prepares students to apply this knowledge in developing engineering solutions to mitigate pollution, directly aligning with PO1's objective of using diverse knowledge areas to address complex engineering problems.

CO2 aligns with PO6 by addressing societal, health, safety, legal, and cultural issues associated with environmental pollution. **CO2 directly aligns with PO7** as it involves understanding the impact of environmental pollution on societal and environmental contexts. It emphasizes the need for sustainable development by recognizing the implications of engineering solutions on the environment. CO2 aligns with PO12 by recognizing the need for life-long learning and the ability to engage independently in continuous learning throughout their professional careers. This mapping ensures that engineers can effectively contribute to solutions that safeguard both human health and the environment.

CO3 integrates societal, environmental, and sustainability considerations. CO3 contributes to PO1 by providing students with knowledge of sustainable approaches for environmental remediation. This aligns with the application of engineering knowledge, including mathematics, science, and engineering fundamentals, to develop solutions for complex environmental problems. CO3 aligns with PO2 by emphasizing problem analysis in the context of environmental remediation. It involves identifying, formulating, and analyzing complex engineering problems related to environmental degradation, integrating principles from mathematics, natural sciences, and engineering sciences. **CO3 directly aligns with PO6** by fostering reasoning informed by contextual knowledge. Assessing societal, health, safety, legal, and cultural issues related to environmental remediation is integral to the responsible and ethical practice of professional engineering. **CO3 explicitly aligns with PO7** by emphasizing the understanding of the impact of professional engineering solutions in societal and environmental contexts.

CO4, centered on understanding environmental problems, degradation, social issues, and sustainable development, aligns with multiple Program Outcomes (POs). CO4 contributes to PO1

by providing students with a comprehensive understanding of environmental problems, which serves as a foundation for applying engineering knowledge to solve complex problems. CO4 aligns with PO2 by emphasizing the identification, formulation, and analysis of complex engineering problems related to environmental issues. **CO4 directly aligns with PO6** by fostering reasoning informed by contextual knowledge. Understanding environmental problems requires assessing societal, health, safety, legal, and cultural issues, contributing to the broader responsibilities of professional engineering practice. **CO4 explicitly aligns with PO7** by emphasizing the understanding of the impact of professional engineering solutions in societal and environmental contexts. The focus on sustainable development within CO4 reinforces the need for environmentally responsible engineering practices. CO4 supports PO12 by recognizing the need for life-long learning. Environmental issues evolve, and engineers must engage in independent learning to stay informed about technological changes and advancements in environmental science and engineering.

CO1, CO3, and CO4 are mapped with PSO2. This mapping ensures a seamless integration of theoretical understanding with practical and research-oriented skills. PSO2 encourages students to stay updated with the latest technologies of environmentally friendly in their field. This can enhance their ability to study natural ecosystems and biodiversity through advanced tools and methodologies. PSO2 broadens the scope by encouraging students to explore fundamental and applied aspects of their field.