
SUSTAINABLE
DEVELOPMENT
GOALS


17
PARTNERSHIPS
FOR THE GOALS

Outcome-Based Education & SDG Alignment Report

This report establishes a comprehensive outcome-based education (OBE) and United Nations Sustainable Development Goal (SDG) alignment framework for the Environmental Sciences curriculum in undergraduate engineering education. Prepared for departmental curriculum review, Board of Studies (BoS) evaluation, and accreditation audits under NAAC and NBA Tier I guidelines, this document provides a unit-wise mapping of syllabus content, Course Outcomes (COs), Programme Outcomes (POs), correlation strength justifications, and SDG target linkages.

1. Executive Framing & Accreditation Context

Engineering programs accredited under Outcome-Based Education frameworks must demonstrate that foundational core courses explicitly contribute to defined graduate attributes. The Environmental Sciences curriculum serves as a mandatory multidisciplinary bridge connecting basic scientific principles with professional engineering ethics, environmental legislation, public health, and global sustainability.

1.1 Structural Foundations and Assessment Architecture

The course framework replaces generic, unmeasured environmental statements with five specific, measurable Course Outcomes (CO1 through CO5) indexed to Bloom's Taxonomy. Each outcome is mapped to corresponding Programme Outcomes using a three-tier correlation scale:

- **Level 3 (Strong Correlation):** Assessed direct mastery where the course content and evaluation items explicitly address the graduate attribute.
- **Level 2 (Moderate Correlation):** Assessed supportive context where principles are applied as secondary analytical or contextual components.
- **Level 1 (Low Correlation):** Introductory exposure without major direct assessment metrics.
- **Level – (No Assessed Contribution):** Outcome not directly evaluated within the current course syllabus.

This alignment ensures that academic documentation for accreditation avoids arbitrary score assignments and instead presents verifiable assessment evidence grounded in evaluated student work.

2. Measurable Course Outcomes & Cognitive Demand

The course architecture establishes a deliberate cognitive progression, advancing students from foundational ecological understanding (Bloom Level L2) to analytical diagnosis of environmental degradation (Level L4) and practical application of statutory frameworks and risk mitigation plans (Level L3).

The five measurable outcomes and their corresponding cognitive levels are structured as follows:

Course Outcome	Detailed Outcome Statement	Unit Linkage	Bloom's Cognitive Level
CO1	Explain ecosystem structure, functions, food chains, food webs, and ecological pyramids, and classify natural resources.	Unit I	**L2 Understand**
CO2	Analyse biodiversity values, threats, and conservation strategies in Indian and local environmental contexts.	Unit II	**L4 Analyse**
CO3	Analyse sources and impacts of pollution and compare suitable control measures for air, water, soil, and noise pollution.	Unit III	**L4 Analyse**
CO4	Explain climate change, ozone depletion, deforestation, and desertification, and relate international agreements and national initiatives to mitigation.	Unit III	**L2 Understand**
CO5	Apply environmental legislation and EIA principles to a given case and prepare a basic environmental management plan incorporating risk mitigation.	Unit IV	**L3 Apply**

3. Unit-Wise Syllabus, PO Correlation, and SDG Alignment

The four units of the syllabus systematically address ecological theory, biotic resources, pollution mitigation technologies, global environmental policy, and statutory compliance. Each unit is mapped below to its corresponding CO, PO correlation strengths, and targeted United Nations SDGs.

3.1 Unit I: Ecosystems and Natural Resources

Syllabus Scope

Definition, scope, and importance of ecosystems; classification, structural components (biotic and abiotic), and functional dynamics of ecosystems; energy flow models including food chains, food webs, and ecological pyramids. Comprehensive classification and management principles for water resources, mineral resources, land resources, and energy resources.

Course & Programme Outcome Correlations

Linked Outcome: CO1 (L2 Understand)

- **PO1 (Engineering Knowledge) — Level 2 (Moderate):** Scientific foundational principles of energy flow and material cycles provide essential contextual knowledge for engineering systems.
- **PO7 (Environment and Sustainability) — Level 3 (Strong):** Understanding ecological balance and resource limits directly establishes the foundation for sustainable resource utilization.

Mapping to United Nations Sustainable Development Goals

The topics in Unit I directly support global targets for water preservation, renewable energy management, and land ecosystem balance:

SDG Alignment	SDG Title	Direct Syllabus Linkage & Contribution
SDG 6	Clean Water and Sanitation	Analysis of global and local water resource classification, availability, and sustainable management practices.
SDG 7	Affordable and Clean Energy	Systematic categorization of renewable and non-renewable energy resources and conservation principles.
SDG 12	Responsible Consumption & Production	Natural resource mapping, material balance principles, and preventing resource depletion.
SDG 15	Life on Land	Structural protection of terrestrial ecosystem mechanics, trophic pyramids, and ecological functional stability.

Unit Strengths & Curriculum Evaluation

Unit I achieves a strong foundational alignment with environmental sustainability by grounding engineering students in ecological thermodynamics and resource limits. It establishes the physical baseline required to evaluate industrial inputs and environmental carrying capacities.

3.2 Unit II: Biodiversity and Biotic Resources

Syllabus Scope

Genetic, species, and ecosystem diversity; multi-dimensional valuation of biodiversity including consumptive, productive, social, ethical, aesthetic, and optional values. Profile of India as a mega-diversity nation; key national biodiversity hotspots; critical threats including habitat fragmentation, poaching of wildlife, and human-wildlife conflicts. Conservation mechanisms: In-situ (national parks, sanctuaries, biosphere reserves) and Ex-situ (gene banks, botanical gardens, seed banks) strategies.

Course & Programme Outcome Correlations

Linked Outcome: CO2 (L4 Analyse)

- **PO1 (Engineering Knowledge) — Level 2 (Moderate):** Biological concepts support environmental assessment models.
- **PO2 (Problem Analysis) — Level 2 (Moderate):** Analytical identification of threats and conservation option trade-offs.
- **PO6 (The Engineer and Society) — Level 2 (Moderate):** Analyzing human-wildlife conflicts and community dependencies on biological resources.
- **PO7 (Environment and Sustainability) — Level 3 (Strong):** Direct focus on biodiversity preservation and ecological resilience.
- **PO8 (Ethics) — Level 2 (Moderate):** Evaluation of intrinsic, ethical, and aesthetic values of non-human species and equitable resource sharing.

Mapping to United Nations Sustainable Development Goals

The conservation principles and threat assessments in Unit II contribute directly to global targets addressing inequality, aquatic ecosystems, terrestrial life, and regulatory enforcement:

SDG Alignment	SDG Title	Direct Syllabus Linkage & Contribution
SDG 10	Reduced Inequalities	Addressing bio-resource access rights, indigenous community livelihood impacts, and ethical resource distribution.
SDG 14	Life Below Water	Aquatic and wetland biodiversity valuation and conservation strategies.
SDG 15	Life on Land	Halting habitat degradation, mitigating poaching, resolving human-wildlife conflicts, and expanding protected areas.
SDG 16	Peace, Justice & Strong Institutions	Institutional mechanisms for resolving community-wildlife disputes and enforcing conservation frameworks.

Unit Strengths & Curriculum Evaluation

Unit II exhibits exceptional multi-outcome integration, connecting technical problem analysis with societal responsibility and professional ethics. It compels engineering students to evaluate economic development against biodiversity loss.

3.3 Unit III: Environmental Pollution, Control Technologies & Global Climate Issues

Syllabus Scope

Classification, sources, pathways, public health impacts, and engineering control technologies for air pollution, water pollution, soil pollution, and noise pollution. Global environmental challenges: mechanisms and impacts of climate change, ozone layer depletion by ozone-depleting substances (ODS), widespread deforestation, and desertification. International treaties and protocols: United Nations Earth Summit, Kyoto Protocol, and Montreal Protocol. National strategies: National Action Plan on Climate Change (NAPCC, Government of India).

Course & Programme Outcome Correlations

Linked Outcomes: CO3 (L4 Analyse) & CO4 (L2 Understand)

- **PO1 (Engineering Knowledge) — Level 2 (Moderate):** Understanding chemical pathways and abatement mechanisms.
- **PO2 (Problem Analysis) — Level 3 (Strong for CO3):** Rigorous diagnosis of pollution sources, pathways, and comparative evaluation of control technologies. (Unmapped for CO4).
- **PO6 (The Engineer and Society) — Level 2 (Moderate):** Evaluating public health vulnerabilities and societal impacts of pollution and climate change.
- **PO7 (Environment and Sustainability) — Level 3 (Strong for both CO3 & CO4):** Core alignment with pollution abatement, global climate mitigation, and international environmental governance.

Mapping to United Nations Sustainable Development Goals

Unit III directly addresses human health, clean water access, sustainable urban centers, global climate action, and land restoration:

SDG Alignment	SDG Title	Direct Syllabus Linkage & Contribution
SDG 3	Good Health and Well-Being	Reducing morbidity and mortality associated with air emissions, water contamination, toxic soil pollution, and noise exposure.
SDG 6	Clean Water and Sanitation	Industrial and municipal wastewater treatment technologies and pollution control measures.
SDG 11	Sustainable Cities & Communities	Urban air quality monitoring, municipal pollution mitigation, and noise management protocols.
SDG 13	Climate Action	Comprehensive coverage of greenhouse gas dynamics, Kyoto Protocol compliance, Montreal Protocol ODS phase-out, and NAPCC adaptation initiatives.
SDG 15	Life on Land	Combating soil degradation, land contamination, deforestation, and progressive desertification.

Unit Strengths & Curriculum Evaluation

Unit III delivers the highest technical analysis demand, providing students with diagnostic capability to map pollution sources to environmental pathways. Furthermore, it directly operationalizes global climate goals by examining both treaty commitments and national policy frameworks.

3.4 Unit IV: Environmental Policy, Legislation & EIA

Syllabus Scope

Statutory legal frameworks: Environmental Protection Act (EPA), Air (Prevention and Control of Pollution) Act 1981, Water (Prevention and Control of Pollution) Act, Forest Conservation Act, Wildlife Protection Act, and Municipal Solid Waste Management and Handling Rules. Environmental Impact Assessment (EIA): EIA structural workflow, baseline data acquisition techniques across environmental parameters, multi-attribute impact analysis (air, water, biological, socio-economic), risk assessment strategies, and formulation of Environmental Management Plans (EMP).

Course & Programme Outcome Correlations

Linked Outcome: CO5 (L3 Apply)

- **PO1 (Engineering Knowledge) — Level 2 (Moderate):** Knowledge of regulatory standards and environmental baseline measurement.
- **PO2 (Problem Analysis) — Level 3 (Strong):** Systematic impact identification, risk prioritization, and evaluation of baseline environmental data.
- **PO6 (The Engineer and Society) — Level 3 (Strong):** Statutory legal compliance, community protection, public hearing considerations, and socio-economic impact assessment.
- **PO7 (Environment and Sustainability) — Level 3 (Strong):** Crafting actionable EMPs to enforce long-term environmental protection and mitigation.
- **PO8 (Ethics) — Level 2 (Moderate):** Transparent reporting, professional responsibility in EIA baseline acquisition, and ethical compliance with environmental statutes.

Mapping to United Nations Sustainable Development Goals

The statutory compliance and management planning topics in Unit IV support urban management, responsible waste handling, governance, and institutional partnerships:

SDG Alignment	SDG Title	Direct Syllabus Linkage & Contribution
SDG 11	Sustainable Cities & Communities	Enforcement of Municipal Solid Waste Management rules and integration of socio-economic impacts in urban development EIA.
SDG 12	Responsible Consumption & Production	Waste management compliance, hazardous material handling rules, and industrial waste minimization via EMPs.
SDG 16	Peace, Justice & Strong Institutions	Statutory compliance with national environmental legislation (Air, Water, Forest, Wildlife Acts) and institutional governance.
SDG 17	Partnerships for the Goals	Multi-sectoral stakeholder engagement in EIA public consultations and regulatory compliance networks.

Unit Strengths & Curriculum Evaluation

Unit IV represents the pinnacle of professional application in the course, simultaneously achieving strong correlations across three crucial outcomes: Problem Analysis, Societal Responsibility, and Sustainability. It bridges academic study with real-world engineering compliance and regulatory risk mitigation.

4. Quantitative Correlation Matrices & Structural Analysis

Accreditation guidelines require explicit presentation of course mapping matrices. To accommodate differing institutional frameworks, two alternative mapping frameworks are presented below, followed by a critical assessment of mapped versus unmapped attributes.

4.1 Standard 12-PO Matrix (NBA Tier I Engineering Manual, January 2025)

This primary matrix employs the approved 12 Programme Outcome labels standard across Washington Accord aligned engineering curricula:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	–	–	–	–	–	3	–	–	–	–	–
CO2	2	2	–	–	–	2	3	2	–	–	–	–
CO3	2	3	–	–	–	2	3	–	–	–	–	–
CO4	2	–	–	–	–	2	3	–	–	–	–	–
CO5	2	3	–	–	–	3	3	2	–	–	–	–

4.2 Alternative 11-PO Framework Matrix

For institutions utilizing the alternative 11-PO framework (where societal and environmental attributes are unified under PO6, and ethics is designated as PO7), the approved mapping shifts as follows:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1	2	–	–	–	–	–	3	–	–	–	–
CO2	2	2	–	–	–	2	3	2	–	–	–
CO3	2	3	–	–	–	2	3	–	–	–	–
CO4	2	–	–	–	–	2	3	–	–	–	–
CO5	2	3	–	–	–	3	3	2	–	–	–

4.3 Structural Analysis of Mapped vs. Unmapped Outcomes

A rigorous accreditation audit requires explicit justification for unmapped outcome cells to demonstrate mapping integrity:

Consistently Mapped Outcomes (PO1, PO2, PO6, PO7, PO8):

- **PO7 (Environment & Sustainability):** Achieves maximum correlation (Level 3) across all five Course Outcomes, establishing the course as a primary curricular pillar for sustainability education.
- **PO1 (Engineering Knowledge):** Maintained at Level 2 across all outcomes, reflecting necessary scientific background without advancing complex engineering design.
- **PO2 & PO6:** Strongly reinforced in analytical and legal units (CO3, CO5) where students diagnose problems and evaluate societal regulatory limits.

Intentionally Unmapped Outcomes (PO3, PO4, PO5, PO9, PO10, PO11, PO12):

- **PO3 & PO4 (Design & Investigations):** Unmapped because the syllabus provides introductory theoretical exposure and basic management planning, but does not include full engineering design projects, laboratory experimentation, or complex problem investigations.
- **PO5 (Modern Tool Usage):** Unmapped as modern software tools (e.g., GIS, air dispersion modeling software, life-cycle assessment tools) are not formally assessed in the current syllabus.
- **PO9–PO12 (Teamwork, Communication, Finance, Lifelong Learning):** Unmapped due to the absence of dedicated, evaluated team project deliverables, formal oral presentations, project financial calculations, or structured independent learning assignments in the core course framework.

5. Assessment Evidence, Attainment Protocol & CQI Framework

To validate claimed outcome correlations during NAAC/NBA peer team reviews, the course coordinator must maintain an auditable assessment trail linking examination items directly to specific Course Outcomes.

5.1 Direct Assessment Evidence Mapping

The specific assessment instruments and evidence types required for each Course Outcome are detailed below:

Course Outcome	Primary Assessment Method	Specific Requirements Assessment Evidence
CO1	Written Examination / Quiz	Test items requiring labeled ecosystem structural models, food web energy flow diagrams, and correct resource classification schemes.
CO2	Structured Case Analysis	Written case analysis evaluating local biodiversity threats, comparative in-situ vs. ex-situ trade-offs, societal impacts, and ethical considerations.
CO3	Problem Diagnostic Case	Analytical case questions requiring identification of pollutant sources, pathways, public health impacts, and comparative evaluation of abatement technologies.
CO4	Policy & Global Issue Exam	Essay questions examining global warming mechanisms, treaty obligations (Kyoto/Montreal), and national policy initiatives (NAPCC).
CO5	Guided EIA/EMP Project	Practical case assignment requiring baseline data acquisition structuring, impact matrix construction, statutory legal alignment, and risk mitigation EMP formulation.

5.2 Direct Attainment Calculation Methodology

Course Outcome attainment must be calculated from actual evaluated student performance rather than indirect perceptions. The approved departmental calculation workflow is defined as:

1. Item-to-CO Mapping: Every question in internal tests, assignments, and end-semester examinations is explicitly mapped to a single CO on the question paper rubric.

2. Threshold Definition: The department establishes a target performance threshold (e.g., 60% marks in an item) and an attainment target (e.g., 70% of enrolled students attaining the threshold).

3. Attainment Percentage Formula:

CO Achievement Percentage = (Number of Students Meeting Threshold / Total Number of Valid Assessed Students) × 100

4. Attainment Level Assignment: Departmental target bands map percentage ranges to final attainment levels (e.g., Level 3 if ≥ 70%, Level 2 if 60%–69%, Level 1 if 50%–59%).

5.3 Closed-Loop Continuous Quality Improvement (CQI) Protocol

Accreditation frameworks require that attainment results directly drive course enhancements through a closed-loop review mechanism:

Step 1: Direct Attainment Calculation: Measure student performance against approved CO threshold percentages using evaluated direct evidence.

Step 2: Target Evaluation: Compare calculated CO attainment against the department's predefined target benchmark.

Step 3A: Target Met Action: If the target benchmark is achieved, maintain pedagogical best practices and incrementally raise performance thresholds for subsequent course offerings.

Step 3B: Target Unmet Action & Gap Analysis: If attainment falls short of the target, identify specific learning gaps, analyze root causes (e.g., prerequisite gaps, insufficient problem-solving practice), and record targeted pedagogical interventions.

Step 4: Re-evaluation: Implement corrective pedagogical measures in the next course iteration and reassess attainment impact to verify closed-loop quality improvement.

6. Strategic Recommendations for Curriculum Enhancement

To further strengthen outcome mappings and address currently unmapped attributes during future Board of Studies (BoS) curriculum revisions, the following strategic enhancements are recommended:

- **Integrate Modern Environmental Tools (PO5 Linkage):** Incorporate a mandatory computer laboratory module utilizing Geographic Information Systems (GIS) for baseline EIA mapping or software-based life-cycle analysis (LCA) to justify mapping PO5 (Modern Tool Usage) at Level 2.

- **Introduce Team-Based Environmental Management Projects (PO9 & PO10 Linkage):** Restructure the EIA/EMP assignment (CO5) as a formal group project requiring written reports and oral presentations, enabling mapping of PO9 (Individual & Team Work) and PO10 (Communication) at Level 2.
- **Incorporate Engineering Design Solutions (PO3 Linkage):** Expand Unit III pollution control coverage to include miniature engineering design problems (e.g., sizing a cyclone separator or designing a basic sedimentation tank) to establish assessed justification for PO3 (Design and Development of Solutions) at Level 2.

SYLLABUS FOR ENVIRONMENTAL STUDIES

MC401	ENVIRONMENTAL STUDIES	L	T	P	C	TOTALMARKS
		2	0	0	2	50

PREREQUISITES:NIL

COURSE OBJECTIVES

The main objectives of this course are to:

1	Understand the concept of the **environment**, its **significance** and the **structure and function of ecosystems**.
2	Understand the concepts of **renewable** and **non-renewable energy sources**, and the **Significance of natural resources**.
3	Explain the concept of **biodiversity**, including its **genetic**, **species**, and **ecosystem diversity**, And the **conservation of endangered and endemic species**.
4	Understand the **effects and control measures of various types of pollution** and the **Importance of solid waste management**.
5	Understand the **causes, effects, and solutions to environmental issues** ,and the **various Environmental protection laws**.

UNIT1:	**Environment and Ecosystem**	**07**

Ecosystems: Definition, Scope, and Importance of ecosystem. Classification, structure, and function of an ecosystem, Food chains, food webs, and ecological pyramids. Natural Resources: Classification of Resources, water resources, Mineral resources, Land resources, Energy resources.

UNIT2:	**Biodiversity And Biotic Resources**	**08**

Introduction, Definition, genetic, species and ecosystem Diversity. Value of biodiversity; consumptive use, productive use, social, ethical, aesthetic and optional Values. India as a mega diversity nation, Hot spots of biodiversity. Threats to biodiversity: Habitat loss, poaching of wildlife, man-wildlife conflicts; conservation of biodiversity: In-Situ and Ex-situ Conservation.

UNIT3:	**Environmental Pollution and Control Technologies**	**08**

Environmental Pollution and Control Technologies: Environmental Pollution: Classification of pollution, Air Pollution, Water pollution, Soil Pollution, Noise Pollution, Climate change and impacts on human environment. Ozone depletion and Ozone depleting substances (ODS).Deforestation and desertification. International conventions /Protocols: Earth summit, Kyoto protocol, and Montréal Protocol. NAPCC- GoI Initiatives.

UNIT4:	**Environmental Policy, Legislation & EIA**	**07**

Environmental Protection act, Legal aspectsAirAct-1981, Water Act, Forest Act, Wildlife Act, Municipal solid waste management and handling rules EIA: EIA structure, methods of base line data acquisition. Overview on Impacts of air, water, biological and Socio economical aspects. Strategies for risk assessment, Concepts of Environmental Management Plan (EMP).

30 Periods

TEXT BOOKS & REFERENCES

1.	Text book of Environmental Studies for Undergraduate Courses by Erach Bharucha for University Grants Commission.
2.	Environmental Studies by R. Raja gopalan, Oxford University Press.
3.	M. Chandrasekhar, Environmental science, HiTechPublishers,2009.
4.	P.N. Modi (2006), Water supply Engineering – Environmental Engineering (Vol. I) – Standard Book House.
5.	Gerard Kiely, Environmental Engineering, McGraw Hill Education Pvt Ltd, Special Indian Edition, 2007.
6.	Environmental Science: towards a sustainable future by Richard T. Wright. 2008 PHL Learning Private Ltd. New Delhi.
7.	Environmental Engineering and science by Gilbert M. Masters and WendellP.Ela.2008PHI
8.	Environmental Science by Daniel B. Botkin & Edward A. Keller, Wiley INDIA edition

LESSON PLAN

Course Code: MC401 Degree/Branch: B.Tech./Chemistry
Course Name: **Environmental Studies** Total No. of credits**: 2**

Year/Sem: II/III Tutorial Hours : 6
Faculty Name**:** Dr. Kumara Swamy Jella Lecture Hours : 6

Course Delivery & Unit Lesson Plan

Unit	Periods	Topics Covered	Bloom	SDG	Tech	Res	CO	PO	PSO
1	1	Structure and functions of Ecosystem	K1	13,14,15	PPT	R1	CO1	1	1
1	1	Producers, consumers, and decomposers	K1	13,14,15	PPT	T1	CO1	1	0
1	1	Energy flow in the ecosystem & Pyramids	K1	13,14,15	BB	T1	CO1	1	0
1	1	Food chain & Food web pathways	K1	13,14,15	PPT	R1	CO1	1	1
1	1	Types of ecosystem: Forest and Grassland	K1	13,14,15	PPT	T1	CO1	1	1
1	1	Desert and aquatic ecosystems	K1	13,14,15	BB	R1	CO1	1	0
1	1	Classification of Natural Resources	K2	6,7,12,15	BB	R1	CO2	1	1
2	1	Genetic,	K2	13,14,15	BB	R1	CO3	1	1

		species, and ecosystem diversity							
2	2	Biodiversity at global and national (India) levels	K2	13,14,15	BB	R1	CO3	1	0
2	2	Endemic & Endangered species of India	K2	13,14,15	PPT	R1	CO3	1	1
2	2	Threats and Conservation (In-Situ & Ex-Situ)	K2	13,14,15	PPT	R1	CO3	1	0
3	2	Causes, effects and control of Air & Water pollution	K2	3,6,14,15	BB	T1	CO4	1,2	2
3	2	Causes, effects and control of Soil pollution	K2	3,6,14,15	BB	T1	CO4	2	3
3	2	Marine pollution, Climate change & Ozone depletion	K1	3,6,14,15	PPT	T1	CO4	2,3	2,3
3	2	Solid waste management & Disaster management	K1	3,6,14,15	PPT	T1	CO4	2	3
4	2	Environmental Protection Act & Air/Water	K2	16	BB	T2	CO5	1	1

		Acts							
4	3	Forest, Wildlife, and Municipal Solid Waste Rules	K2	15	BB	T2	CO5	1	0
4	2	EIA structure & Baseline data acquisition methods	K2	12	PPT	R2	CO5	1,2	1

Course Outcomes (COs) Summary

CO1: Explain the scope, significance of environment and the structure, function, and types of ecosystems.

CO2: Differentiate renewable and non-renewable energy sources, analyze natural resources, and evaluate overuse depletion problems.

CO3: Define biodiversity levels, values, threats, and formulate In-Situ and Ex-Situ conservation methodologies.

CO4: Analyze causes, effects, and control technologies for various types of environmental pollution and solid waste networks.

CO5: Evaluate Environmental Legislation/Acts, Risk Assessments, and compile comprehensive Environmental Management Plans (EMP) via EIA structures.

4. Learning Resources

Textbooks

- Erach Bharucha, *Textbook of Environmental Studies for Undergraduate Courses*, University Grants Commission.
- R. Rajagopalan, *Environmental Studies*, Oxford University Press.
- M. Chandrasekhar, *Environmental Science*, HiTech Publishers, 2009.
- P.N. Modi, *Water Supply Engineering – Environmental Engineering (Vol. I)*, Standard Book House, 2006.

- Gerard Kiely, *Environmental Engineering*, McGraw Hill Education Pvt Ltd, Special Indian Edition, 2007.

Reference Books

- Richard T. Wright, *Environmental Science: Towards a Sustainable Future*, 2008, PHI Learning Private Ltd., New Delhi.
- Gilbert M. Masters and Wendell P. Ela, *Environmental Engineering and Science*, 2008, PHI Learning Pvt. Ltd.
- Daniel B. Botkin & Edward A. Keller, *Environmental Science*, Wiley INDIA edition.
- Anubha Kaushik, *Environmental Studies*, 4th Edition, New Age International Publishers.
- Dr. M. Anji Reddy, *Textbook of Environmental Science and Technology*, 2007, BS Publications.
- Y. Anjaneyulu, *Introduction to Environmental Science*, BS Publications.

The curriculum highlights environmental literacy by covering subjects like ecosystems, biodiversity conservation, pollution control, sustainable resource management, waste reduction, and climate change mitigation. Through field visits, case studies, community outreach, and project-based learning, students are motivated to connect scientific concepts with practical sustainability challenges.

The lesson plans developed by faculty clearly link every topic, unit, or pertinent SDG, guaranteeing that students acquire not only subject-specific knowledge but also grasp its wider social, environmental, and ethical consequences.

Through this SDG-integrated lesson planning approach:

- Learners build sustainability literacy by connecting classroom ideas with worldwide issues.
- Faculty employs context-based instructional approaches, including case studies, seminars, and project-based learning, to highlight outcomes driven by the SDGs.
- Assessment elements, such as assignments and presentations, promote critical reflection on how scientific knowledge adds to sustainable development.

CHAITANYA
(DEEMED TO BE UNIVERSITY)
(Approved u/s. 3 of UGC act. 1956 by MHRD, Govt. of India)



Chaitanya (Deemed to be University) faculty engaged in teaching Environmental Studies

Conclusion:

The institution's dedication to substantive education on the SDGs demonstrates a proactive endeavor to build knowledge, strengthen capacities, and empower learners to become responsible global citizens. By embedding SDG concepts into academic curricula, value-added courses, seminars, and community-oriented educational initiatives, the institution guarantees that students, faculty, and stakeholders cultivate a thorough comprehension of global challenges and sustainable development pathways.

Via collaborative platforms, expert talks, and interdisciplinary learning opportunities, the institution actively encourages knowledge sharing and nurtures partnerships that amplify collective impact, fully consistent with SDG17.4.1. These endeavors not only improve the quality of education but also establish a culture of sustainability, innovation, and social responsibility. Ultimately, this dedication reinforces institutional capacity, equips students for real-world problem solving, and contributes to attaining the SDGs at local, national, and global levels.