

Assignment Manual for
Environmental Science, Sustainability and
Renewable Energy
(BE04000101)

B.E. Semester 4



Directorate of Technical Education, Gandhinagar,
Gujarat

College Name :

Certificate

This is to certify that Mr./Ms. _____

Enrollment No. _____ of B.E. Semester 4, _____

Engineering of this Institute (028) has satisfactorily completed the assignment work for the subject **Environmental Science, Sustainability and Renewable Energy (BE04000101)** for the academic year 202__-2__.

Place: _____

Date: _____

Name and Sign of Faculty member

Head of the Department

Preface

Main motto of any laboratory/practical/field work is for enhancing required skills as well as creating ability amongst students to solve real time problem by developing relevant competencies in psychomotor domain. By keeping in view, GTU has designed competency focused outcome-based curriculum for engineering degree programs where sufficient weightage is given to practical work.

The awareness of environmental issues is spreading rapidly and has gained importance on a global scale, leading to better prospects for systematic studies in Environmental Science, Sustainability, and Renewable Energy. Over the last decade, a significant number of undergraduate and postgraduate courses in Environmental Science and Sustainability have been introduced in most universities in India. In addition, the University Grants Commission (UGC) has made Environmental Studies a mandatory component of the syllabus for all basic degree programs in the country.

Most newly introduced undergraduate courses in Environmental Science–related subjects include tutorial sessions. This laboratory manual enables students to familiarize themselves with the relevant topics in advance of the actual practical sessions, thereby generating interest and providing a basic understanding prior to performance. This, in turn, enhances the attainment of predetermined learning outcomes among students. The manual is designed to serve as a comprehensive reference.

The primary objective of this tutorial manual is to enhance students' skills and abilities to analyze and solve real-time environmental problems through the development of relevant technical and professional competencies. In line with the Gujarat Technological University (GTU) competency-focused, outcome-based curriculum, this manual acts as a structured learning tool to cultivate industry-relevant skills that are often challenging to achieve through conventional classroom instruction alone.

This course is designed to develop environmental awareness and foster sustainable thinking by addressing key environmental issues such as pollution control, waste management, sustainability, climate change, and the growing need for renewable energy. Students will acquire a sound understanding of the scientific principles underlying environmental degradation, the fundamentals and applications of sustainability and renewable energy technologies, and the role of engineering solutions in mitigating environmental challenges in a sustainable and responsible manner.

Utmost care has been taken while preparing this question book however always there is chances of improvement. Therefore, we welcome constructive suggestions for improvement and removal of errors if any.

Course Outcomes (COs):

- CO-1 Highlight the importance of environmental sciences.
- CO-2 Identify the types of pollution in society along with their sources, causes, effects & Mitigation.
- CO-3 Explain the generation, impacts, and management of various types of wastes and describe the causes and effects of acid rain and ozone layer depletion.
- CO-4 Describe the concepts of sustainability, climate change phenomena and green building principles.
- CO-5 Recognize the role of Renewable Energy in sustainable development.

Sr. No.	Assignments	CO1	CO2	CO3	CO4	CO5
1.	Introduction to Environment	√				
2.	Environmental Pollution					
2.A	Water Pollution		√			
2.B	Air Pollution		√			
2.C	Noise Pollution		√			
2.D	Land Pollution		√			
2.E	Solid Waste			√		
2.F	Bio-medical Waste			√		
2.G	E-waste			√		
2.H	Acid Rain, Depletion of Ozone layer			√		
3.	Sustainability					
3.A	Definition, scope				√	
3.B	Sustainable development & Circular economy, SDGs				√	
3.C	Climate Change				√	
3.D	Green Building				√	
3.E	Concept of 4R's				√	
4.	Renewable Energy					
4.A	Conventional Vs Renewable Energy					√
4.B	Green Hydrogen					√

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(Progressive Assessment Sheet)

Sr. No.	Assignments	Page No.	Date of performance	Date of submission	Assessment Marks	Sign. of Teacher with date	Remarks
1.	Introduction to Environment						
2.	Environmental Pollution						
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4.	Renewable Energy						
4.A	Conventional Vs Renewable Energy						
4.B	Green Hydrogen						
Total							

Assignment 1: Introduction to Environment (CO1)

1. Define the terms: (1) Environment (2) Ecology (3) Ecosystem (4) Pollution (5)sustainable development
2. Explain multidisciplinary nature of ecosystem.
3. Explain the various components of environment.
4. Write a note on structure of atmosphere with neat sketch.
5. Discuss interrelationship between various components of environment.
6. Write a short note on impacts of Human activity on Environment **OR**
Explain in detail the impact of modern technology on environment.
7. Define Environmental degradation and write down the causes of Environmental degradation.
OR
Explain the IPAT equation for environmental degradation.
8. Write a note on importance of environmental education.
9. Explain the role of various engineering disciplines in environmental protection.
10. Discuss the need of sustainable development.
11. Explain the role of a environmental engineer in environment conservation.
12. Suggest the few methods to minimize environmental degradation.

Assignment 2: Environmental Pollution (CO₂, CO₃)

A. Water Pollution (CO₂)

1. Define environmental pollution and enlist types of environmental pollution.
2. Define Water Pollution and what are the signs of polluted water?
3. State the different parameters of water which are to be tested for determining the quality of water.
4. Give the Classification of Water pollutants.
5. Write a short note on Sources and of water pollution.
6. Explain the effects of water pollutants.
7. Write a short note on "Eutrophication."
8. List any three water quality parameters & their importance.
9. Explain the effects of thermal discharge on the receiving water bodies.
- 10 Write the short note on control of Water Pollution.

B. Air Pollution (CO₂)

1. Define Air Pollution.
2. Give composition of air and explain the structure of atmosphere.
3. Explain the different sources of Air Pollution.
4. Give the classification of air pollutants.
5. Enlist different air pollutants with their sources and effects.
6. Explain effects of air pollution on human beings and animals and plants.
7. Discuss ambient air quality standards of important air pollutants.
8. Enlist and explain the important factors affecting air pollution.
9. Discuss the controlling measures of air pollution.

C. Noise Pollution (CO2)

1. Differentiate between sound and noise.
2. Explain sources of noise pollution.
3. What do you understand by acceptable noise level? Briefly describe the effects of noise pollution.
4. Discuss the different noise rating system.
5. Write a short note on control of noise pollution.
6. Explain measurement of noise.

D. Land Pollution (CO2)

1. Define land pollution.
2. List any four sources of land pollution.
3. Name two effects of land pollution on agriculture.
4. State two preventive measures for land pollution.
9. Describe the effects of land pollution on human health.
10. Explain the impact of land pollution on soil fertility.
11. Discuss the role of solid waste management in controlling land pollution.
12. Describe agricultural practices that contribute to land pollution.
13. Explain how industrial activities cause land pollution.
15. Explain land pollution with its sources, effects, and control measures.
16. Discuss land pollution caused by hazardous and electronic waste.

E. Solid Waste: Generation and Management (CO3)

1. Define the terms.(1) Solid waste (2)Garbage (3) Rubbish (4)Putrefaction (5) Leachate
2. Discuss different types and sources of solids waste.
3. Explain causes and effects of solid waste pollution.
4. What are the factors affecting the generation rate of solids waste? Explain them in brief.
5. Why a proper solid waste management system is required for urban areas?
6. Enlist and explain different method of solid waste collection.
7. Explain different methods used for solid waste disposal.
8. Write a short note on landfilling.

F. Bio-medical Waste: Generation and Management (CO3)

1. Define bio-medical waste and infectious waste.
2. Enlist different sources of bio-medical waste.
3. Give classification of bio-medical waste.
4. Explain how bio-medical waste should be segregated before disposal.
5. Enlist and explain different methods used for treatment of bio-medical waste.
6. Explain different thermal processes for bio-medical waste treatment.
7. Enlist the factors affecting generation rate of bio-medical waste and discuss about the overall scenario of generation of bio-medical waste in India
8. Why proper management of bio-medical waste is required?
9. Explain in brief about the functional elements of bio-medical waste management.

G. E-Waste Generation and Management (CO3)

1. Define e-waste.
2. Give the classification of the e-waste. Also give the constituent material of e-waste.
3. What is the environmental and health impact of improper disposal of e-waste?
4. Explain how the e-waste should be managed?
5. Explain the role of government in e-waste management.

H. Global Environmental Issues (CO3)

1. Which are the important global Environmental effects and what are the main causes of these effects?
2. What is acid rain? How it is formed?
3. Write a short note on causes and effects of acid rain.
4. Explain ozone depletion.
5. What can done for the protection of ozone layer?
6. Explain by drawing sketch greenhouse effect.
7. What are the effects of global warming?
8. Which measures can be adopted for controlling global warming?
9. What is climate? Which are the key signs of climate change?
10. State the impact of climate change on environment and human beings.
11. What is carbon foot print? How carbon foot print is calculated for individuals as well as organization.
12. What are the benefits of calculation of carbon footprints?
13. Explain about CDM and its limitations.

Assignment 3: Sustainability (CO4)

A-Sustainable development & Circular economy (CO4)

1. Define Sustainability.
2. Why is sustainable development so often associated with protecting the environment?
3. Enlist at least five Sustainable Development Goals (SDGs).

B-Basic concept of Green Building (CO4)

1. Explain in brief “Green Building”.
2. What are the objectives of green building?
3. Explain the various fundamental principles of green building.
4. Which are different Green Building rating systems? Explain any one in detail.
5. Give the full form of: LEED, IGBC, GRIHA, TERI
6. Define smart city. Discuss the concept of smart city.
7. What are the core infrastructure elements of smart city?

C-Concept of 4R’S (CO4)

1. What are the principles of 4Rs?
2. How the concept of reduction of waste at source helps in waste management?
3. Explain the concept reuse the material to reduce the amount of solid waste.
4. What are the possible ways of recycling the materials?
5. How concept of 4R can be used for developing an effective solid waste management system.

Assignment 4: Renewable Energy (CO5)

A. Renewable Energy (CO5)

1. What is renewable energy?
2. How many different types of renewable energy are there?
3. Differentiate between Conventional and Renewable Energy with examples.
4. Explain the principles of generation for Solar and Wind energy.
5. How can renewable energy benefit the environment?

B. Green Hydrogen (CO5)

1. Explain the term "Green Hydrogen." How does it differ from Grey and Blue hydrogen in terms of environmental impact?
2. Why is storage a major hurdle for the Hydrogen Economy? Compare Compressed Gas storage with Liquid Hydrogen storage.
3. Discuss the "Ammonia as a Carrier" concept. Why is it preferred for international maritime transport of hydrogen?
4. If 55 kWh of renewable electricity is used to produce 1 kg of Hydrogen (which contains 33.3 kWh of energy), what is the efficiency of the electrolysis process?
(Hint: $\text{Efficiency} = \frac{\text{Input Energy}}{\text{Output Energy}} \times 100$)

Environmental Science, Sustainability and Renewable Energy

(Subject Code: BE04000101)

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