



# **Tripura University**

(A Central University)

Suryamaninagar

West Tripura

**Syllabus for  
Four Years Under Graduate Programme  
Subject: ENVIRONMENTAL SCIENCE  
(MINOR)  
(NEP - 2020)**

Year 2025

TRIPURA UNIVERSITY  
Tripura University  
(A Central University)  
Suryamaninagar- 799022 West Tripura

Four Years Undergraduate Programme (As per NEP- 2020)

**Environmental Science**

**Paper: ENSG4T**

**(Theory)**

**Course 4: Environmental Pollution**

**COURSE OBJECTIVES:**

- 1) To introduce the concept and classification of environmental pollution.
- 2) To understand the sources, types, and control technologies for air, water, and soil pollution.
- 3) To develop knowledge about solid waste and hazardous waste management.
- 4) To understand environmental quality parameters and regulatory frameworks.

| CO No.                     | Attributes                                                                                      |                                                                                                                                                                                                                                                                                                               |
|----------------------------|-------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| CO1                        | Understand the definitions, types, and sources of environmental pollution and pollutants.       |                                                                                                                                                                                                                                                                                                               |
| CO2                        | Gain knowledge about air pollution, monitoring, analysis, and pollution control technologies.   |                                                                                                                                                                                                                                                                                                               |
| CO3                        | Comprehend various water pollutants, water quality standards, and treatment methods.            |                                                                                                                                                                                                                                                                                                               |
| CO4                        | Learn about soil pollution, solid and hazardous waste management, including regulatory aspects. |                                                                                                                                                                                                                                                                                                               |
|                            |                                                                                                 |                                                                                                                                                                                                                                                                                                               |
| Unit wise detailed content |                                                                                                 |                                                                                                                                                                                                                                                                                                               |
| Unit 1                     | Number of Lectures 15                                                                           | Title of Unit: Introduction to Environmental Pollution                                                                                                                                                                                                                                                        |
|                            |                                                                                                 | <ul style="list-style-type: none"><li>• Definition of environmental pollution and pollutants</li><li>• Sources: Natural and anthropogenic, point and non-point sources</li><li>• Types of pollutants: Primary and secondary</li><li>• Role of regulatory bodies: MoEFCC, CPCB, NGT, SPCBs, EPA, FSI</li></ul> |
| Unit 2                     | Number of Lectures 20                                                                           | Title of Unit: Air Pollution                                                                                                                                                                                                                                                                                  |
|                            |                                                                                                 | <ul style="list-style-type: none"><li>• Definition, types, and sources of air pollution</li><li>• Major air pollutants and their effects on public health and the environment</li><li>• Indoor air pollution, acid rain, photochemical smog, particulates</li></ul>                                           |

|               |                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|---------------|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|               |                               | <ul style="list-style-type: none"> <li>• Air quality standards and air monitoring</li> <li>• Atmospheric sampling and analysis techniques</li> <li>• Technologies for industrial air pollution control</li> <li>• Prevention and control of air pollution in India</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| <b>Unit 3</b> | <b>Number of Lectures 20</b>  | <b>Title of Unit: Water Pollution</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|               |                               | <ul style="list-style-type: none"> <li>• Classification of water pollutants: Organic and inorganic</li> <li>• Sources: Sewage, agricultural runoff, synthetic compounds, oil, sediments</li> <li>• Bio-concentration and Bio-magnification</li> <li>• Wastewater treatment methods: Preliminary, primary, secondary, tertiary</li> <li>• Water quality parameters: pH, EC, turbidity, TDS, hardness, chlorides, fluorides, salinity, DO, BOD, COD, nitrates, phosphates, heavy metals</li> <li>• Indian standards for drinking water quality</li> <li>• Drinking water treatment: Coagulation, flocculation, sedimentation, filtration, disinfection, softening</li> <li>• Prevention and control of water pollution</li> </ul> |
| <b>Unit 4</b> | <b>Number of Lecturers 20</b> | <b>Title of Unit: Soil Pollution and Solid Waste Management</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|               |                               | <ul style="list-style-type: none"> <li>• Sources and types of soil pollutants: Inorganic, organic</li> <li>• Effects of soil pollution from agriculture, fertilizers, pesticides, industry, and urban waste</li> <li>• Soil pollution control and remediation techniques</li> <li>• Integrated solid waste management and waste hierarchy</li> <li>• Solid waste rules and regulations in India</li> <li>• Municipal solid waste: Sources, characteristics, collection, processing, disposal</li> <li>• Hazardous waste: Characteristics, generation, treatment, and disposal</li> <li>• Management of biomedical waste, plastic waste, and E-waste</li> </ul>                                                                  |

### Suggested Readings:

- 1) **Vallero, D. A.** *Fundamentals of Air Pollution*. 5th ed. Elsevier, 2014.
- 2) **Seinfeld, J. H. & Pandis, S. N.** *Atmospheric Chemistry and Physics: From Air Pollution to Climate Change*. 3rd ed. Wiley, 2016.
- 3) **Rao, C. S.** *Environmental Pollution Control Engineering*. 3rd ed. Wiley-Eastern, 2007.
- 4) **Wark, K. & C. F. Warner.** *Air Pollution: Its Origin and Control*. 2nd ed. Harper & Row, 1976.

- 5) **Sawyer, C. N., McCarty, P. L. & G. F. Parkin.** *Chemistry for Environmental Engineering and Science*. 5th ed. McGraw-Hill, 2003.
- 6) **Peavy, H. S., Rowe, D. R. & G. Tchobanoglous.** *Environmental Engineering*. 3rd ed. McGraw-Hill, 1985.
- 7) **Metcalf & Eddy, Inc.** *Wastewater Engineering: Treatment and Resource Recovery*. 5th ed. McGraw-Hill, 2014.
- 8) **Brady, N. C. & R. R. Weil.** *The Nature and Properties of Soils*. 15th ed. Pearson Prentice Hall, 2016.
- 9) **Tchobanoglous, G., Theisen, H. & S. A. Vigil.** *Integrated Solid Waste Management: Engineering Principles and Management Issues*. 2nd ed. McGraw-Hill, 1993.
- 10) **Pichtel, J.** *Waste Management Practices: Municipal, Hazardous, and Industrial*. 2nd ed. CRC Press, 2014.
- 11) **Vesilind, P. A., Worrell, W. A. & D. R. Reinhart.** *Solid Waste Engineering*. 5th ed. Cengage, 2016.

**COURSE: ENVIRONMENTAL SCIENCE**  
**COURSE CODE: ENSG4P**

**Fourth Semester**

**COURSE OUTCOME:** After successful completion of the course, the students will develop following attribute.

| <b>CO No.</b>                                                                                                                                                                                                                                                                                                                                                                                                                 | <b>Attributes</b>                                                                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------|
| CO1                                                                                                                                                                                                                                                                                                                                                                                                                           | Develop practical skills in environmental sampling and analysis of air, water, and soil.      |
| CO2                                                                                                                                                                                                                                                                                                                                                                                                                           | Apply analytical techniques to assess pollution levels and water/soil quality.                |
| CO3                                                                                                                                                                                                                                                                                                                                                                                                                           | Gain field-level exposure to pollution control strategies and industrial practices.           |
| CO4                                                                                                                                                                                                                                                                                                                                                                                                                           | Understand environmental regulations through institutional visits and real-time observations. |
|                                                                                                                                                                                                                                                                                                                                                                                                                               | <b>Detail Content of Practical</b>                                                            |
| <b><i>Air Quality and Monitoring</i></b> <ol style="list-style-type: none"><li>1. Visit to State Pollution Control Board to understand role and regulations</li><li>2. Sampling and analysis of particulate matter: PM<sub>10</sub>, PM<sub>2.5</sub></li><li>3. Study of air pollutants and calculation of Air Quality Index (AQI)</li><li>4. Visit to local industry to understand pollution control technologies</li></ol> |                                                                                               |
| <b><i>Water Quality Analysis</i></b> <ol style="list-style-type: none"><li>1. Collection and preservation of water samples</li><li>2. Determination of transparency of pond water</li><li>3. Estimation of pH, free dissolved CO<sub>2</sub>, alkalinity, chloride, fluoride</li><li>4. Estimation of nitrate, phosphate, hardness, and dissolved oxygen</li></ol>                                                            |                                                                                               |
| <b><i>Soil Quality Analysis</i></b> <ol style="list-style-type: none"><li>1. Determination of soil pH and moisture</li><li>2. Texture analysis, bulk density, and water-holding capacity</li><li>3. Estimation of soil organic carbon and total nitrogen</li><li>4. Estimation of available and total phosphorus in soil</li></ol>                                                                                            |                                                                                               |

**Suggested Readings:**

- 1) **Patnaik, P.** *Handbook of Environmental Analysis: Chemical Pollutants in Air, Water, Soil and Solid Wastes*. 3rd ed. CRC Press, 2017. ISBN: 978-1498745611
- 2) **Sood, A.** *Laboratory Manual of Environmental Chemistry*. Alpha Science International, 2012.
- 3) **Trivedi, R. K. & P. K. Goel.** *Chemical and Biological Methods for Water Pollution Studies*. Environmental Publication, 1986.

- 4) **APHA, AWWA & WEF.** *Standard Methods for the Examination of Water and Wastewater*. 23rd ed. American Public Health Association, 2017. ISBN: 978-0875532875
- 5) **NEERI.** *Field and Laboratory Manual for Environmental Monitoring*. National Environmental Engineering Research Institute, 2015.
- 6) **CPCB.** *Manual for Ambient Air Quality Monitoring*. Central Pollution Control Board, India, 2013.
- 7) **Lodha, R.** *Environmental Pollution and Control*. McGraw-Hill Education, 2005.
- 8) **Welsch, H.** *Water Quality: Guidelines, Standards and Health*. IWA Publishing, 2008.
- 9) **Manivasakam, N.** *Physico-Chemical Examination of Water, Sewage and Industrial Effluents*. Pragathi Prakashan, 2005.
- 10) **Tandon, H. L. S.** *Methods of Analysis of Soils, Plants, Waters and Fertilizers*. Fertilizer Development & Consultation Organization, 1991.
- 11) **Jackson, M. L.** *Soil Chemical Analysis*. Prentice Hall of India, 1973.