DEPARTMENT OF ENVIRONMENTAL SCIENCE

Category-I

SEMESTER - VI

BSC (H) ENVIRONMENTAL SCIENCE

DISCIPLINE SPECIFIC CORE COURSE – 16 (DSC-EVS-16): ENVIRONMENTAL POLLUTION AND HUMAN HEALTH

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
DSC-EVS-16: ENVIRONMENTAL POLLUTION AND HUMAN HEALTH	4	2	0	2	Class XII pass	NA

Learning objectives

The Learning Objectives of this course are as follows:

- Provide in-depth knowledge about pollution sources, and its effects on human health
- Equip with skills to assess and manage pollution related health risks
- Enable to analyze the roles government agencies, industry, and the public, in protecting environment and human health
- Familiarize with the advancements in research and technology to control environmental pollution and protect human health
- Encourage to apply skills and knowledge to real-world problems of environmental pollution and human health

Learning outcomes

After this course, students will be able to:

- Identify different types and sources of environmental pollutants and associated impacts on human health
- Use analytical techniques to monitor environmental pollutants in air, water, and soil
- Assess the health risks associated with exposure to different pollutants and recommend appropriate strategies to manage associated risks
- Recommend appropriate scientific analysis related to environmental health, risks and solutions to decision-makers

SYLLABUS OF DSC-EVS-16

Theory (02 Credits: 30 lectures)

UNIT – I Introduction **(1 Week)** (2 lectures)

Environmental pollutants and their classification, Link between pollution and human health, Ecological principles and pollution, Environmental health risk assessment, Global perspectives on pollution and health, Ethics and social responsibility in pollution management

UNIT – II Air pollution **(2½ Week)** (5 lectures)

Ambient air quality: monitoring and standards (National Ambient Air Quality Standards of India); air quality index; sources and types of pollutants (primary and secondary); smog (case study); effects of different pollutants on human health (NOx, SOx, PM, CO, CO2, hydrocarbons and VOCs) and control measures; indoor air pollution: sources and effects on human health.

UNIT – III Water pollution **(3 Week)** (6 lectures)

Sources of surface and ground water pollution; water quality parameters and standards; organic waste and water pollution; eutrophication; COD, BOD, DO; effect of water contaminants on human health (nitrate, fluoride, arsenic, chlorine, cadmium, mercury, pesticides); water borne diseases; concept and working of effluent treatment plants (ETPs).

Marine resources and their importance; sources of marine pollution; oil spill and its effects; coral reefs and their demise; coastal area management; existing challenges and management techniques (planning, construction, environmental monitoring of coastal zones).

UNIT – IV Soil pollution **(1 Week)** (2 lectures)

Causes of soil pollution and degradation; effect of soil pollution on environment, vegetation and other life forms; control strategies.

UNIT – V Noise, radioactive and thermal pollution **(2½ Week)** (5 lectures)

Noise pollution – sources; frequency, intensity and permissible ambient noise levels; effect on communication, impacts on life forms and humans - working efficiency, physical and mental health; control measures.

Radioactive material and sources of radioactive pollution; effect of radiation on human health (somatic and genetic effects); thermal pollution and its effects.

UNIT – VI Chemistry of environmental pollutants **(2½Week)** (5 lectures)

Solubility of pollutants (hydrophilic and lipophilic pollutants), transfer of pollutants within different mediums, role of chelating agents in transferring pollutants, concept of biotransformation and bioaccumulation, concept of radioactivity, radioactive decay and half-life of pollutants, organometallic compounds, acid mine drainage.

UNIT – VII Pollution control **(2½Week)** (5 lectures)

Activated Sludge Process (ASP) – Trickling Filters – oxidation ponds, fluidized bed reactors,

membrane bioreactor neutralization, ETP sludge management; digesters, up flow anaerobic sludge blanket reactor, fixed film reactors, sequencing batch reactors, hybrid reactors, bioscrubbers, biotrickling filters; regulatory framework for pollution monitoring and control; case study: Ganga Action Plan; Yamuna Action Plan; implementation of CNG in NCT of Delhi.

Practicals/Hands-on Exercises – based on theory (02 Credits: 60 hours)

1-3. Determine the levels of selected gaseous pollutants (oxides of nitrogen and sulfur, carbon monoxide) and particulate matter
4. Analyze National Ambient Air Quality Standards (NAAQS) of your City and compare it with any other city of similar size and demography from the country or other parts of the world
5-7. Analyze quality of water sampled from different sources based on pH, dissolved oxygen, turbidity, and nutrient contents
8. Analyze the most probable soil pollutants of area near your college and predict its impact on human health
9. Identify health hazard by any target air/water pollutant of your city and develop the possible exposure pathway and predict the associated environmental health risk
10. Assess potential of water pollution control techniques like coagulation-flocculation, sedimentation, filtration, and disinfection
11. Measure the noise levels in different environments using sound level meters and analyze the impacts of noise pollution on human health
12. Determine the probable indoor air pollutants in the buildings of your college and identify their sources
13. Analyze the cases of waterborne Disease during past 30-years in any country of your choice and determine the pattern, if any
14. Practice different communication strategies for educating the pollution-related health hazards and assess their impacts

Teaching and learning interface for theoretical concepts

To achieve the course objectives and match with the contents, a wide range of teaching and learning tools will be employed, including (a) Formal lectures; (b) Interactive sessions using visual aid; (c) Case study analyses; (d) Hypothetical scenario building; (e) Group discussion on key topics; and (f) documentary screening and critical analyses.

Essential/recommended readings

- Brauer, M., & Brook, J. (Eds.). (2019). Air pollution and health (2nd ed.). Academic Press.
- Gee, D. (2019). Toxic legacy: Synthetic toxins in the food, water and air of American cities. MIT Press.
- Gee, D. (2019). Toxic legacy: Synthetic toxins in the food, water and air of American cities. MIT Press.
- Harrison, R. M. (2019). Pollution: Causes, effects and control (5th ed.). Royal Society of Chemistry.
- Lippmann, M. (2019). Environmental toxicants: Human exposures and their health

effects (4th ed.). John Wiley & Sons.
- Merchant, R. M. (2019). An introduction to environmental epidemiology. CRC Press.
- World Health Organization. (2019). Chemicals of public health concern: Fact sheets. World Health Organization.
- Yang, Y., & Khudyakov, J. I. (Eds.). (2020). Environmental surveillance and population monitoring for chemical, biological, and radiological agents. Academic Press.

Suggestive readings

- Clements, A. L. (2019). Green building: Guidebook for sustainable architecture. Routledge.
- Cohen, A. J. (2017). The human cost of air pollution: Health implications for billions of people. The MIT Press.
- Guha, M., & Sircar, N. (Eds.). (2019). Environmental hazards in South Asia: Domestic and transboundary perspectives. Routledge.
- Peterson, R. E. (2019). The fundamentals of environmental chemistry. CRC Press.
- Ritz, B. (2019). Critical windows of exposure to environmental pollutants. Springer.
- White, L. W., & Gibson, J. E. (2019). Principles of toxicology: Environmental and industrial applications (3rd ed.). John Wiley & Sons.

Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.